SECTION 205 FEASIBILITY REPORT

ADA, MINNESOTA

WILD RICE AND MARSH RIVERS, MINNESOTA

APPENDIX D

STRUCTURAL ANALYSIS

ADA, MN

SECTION 205 FLOOD CONTROL STUDY

FEASIBILITY

STRUCTURAL ANALYSIS AND DESIGN

PURPOSE

1. The following describes the design criteria and methods of analyses used for the design and analysis of the structural features of the Ada, MN Section 205 Flood Control Study. A summary of references, material properties, loads, design criteria, and assumptions is presented along with a description of the design of all structural features in the project. Structural features associated with this project include a box culverts and bridge structure, Gatewell west control structures and miscellaneous drainage structures. The primary objective of this effort was to determine feasibility of designs and establish reasonable quantities for the baseline cost estimate. The level of design was conducted to sufficient detail to attain these objectives.

REFERENCES

2. Loading conditions, material design strengths, design criteria and assumptions are based on applicable sections of the following references.

EM 1110-2-2104, Strength Design for Reinforced Concrete Hydraulic Structures (30 June 92)
EM 1110-2-2502, Retaining and Floodwalls (29 Sep 89)
EM 1110-2-2902, Conduits, Culverts and Pipes
EM 1110-1-2101, Working Stresses for Structural Design (01 Nov. 63)
EM 1110-2-2105, Design of Hydraulic Steel Structures (31 May 1994)
EM 1110-2-2504, Design of Sheet Pile Walls (31 March 1994)
ETL 1110-2-256, Sliding Stability for Concrete Structures (24 Jun 81)
ETL 1110-2-307, Flotation Stability Criteria for Concrete Hydraulic Structures (23 Aug 87)
ETL 1110-2-322, Retaining and Floodwalls (15 Oct 90)
American Concrete Institute (ACI) 318-02 Building Code Requirements for Reinforced Concrete.
American Institute of Steel Construction (AISC), Steel Load & Resistance Factor Design, 3rd Ed.
American Concrete Pipe Association (ACPA) Concrete Pipe Handbook
The Aluminum Association Aluminum Design Manual, 1994
Moments and Reactions for Rectangular Plates, United States Department of the Interior, Bureau of Reclamation, Engineering Monograph No. 27.

GENERAL DESIGN PROCEDURES

3. The level of design for the structural features is based on structural design, engineering judgment, past experience, and similar structures designed and constructed for other projects.

DESIGN CRITERIA AND DESIGN DATA

4. Design criteria for general design requirements are listed in the following paragraphs. Design criteria used for specific designs are described in paragraphs specific to those designs.

SOIL PARAMETERS

5. Soil properties are assumed and are shown in the following table. Only drained strengths were considered for designs in this report. Soil pressures are based upon formulae presented in EM 1110-2-2502.

LOCATION	Phi	C	γ_{moist}	γ_{sat}
All	28^{o}	0 psf	116 pcf	117 pcf

HYDRAULIC DATA

6. The Hydraulic Engineering Section provided flood and top of levee elevations for corresponding river sections and geometry of structures. This information was used to determine loading conditions and dimensions of the structures.

SURVEY DATA

7. The General Engineering Section showing the location of project features and the surrounding topography provided survey information. This information was used to determine existing ground elevations and locations of structures.

REINFORCED CONCRETE

8. All reinforced concrete is designed in accordance with the applicable sections of EM 1110-2-2104 and ACI 318-02. Concrete design is based upon the Ultimate Strength Design Method with the design strength of concrete at 28 days, f_c', taken as 4,000 psi. A uniform load factor of 1.7 was used for all reinforced concrete design with additional factor of 1.3 applied to all hydraulic structures.

9. Concrete reinforcing steel is ASTM A615 Grade 60 with a yield stress, f_y of 60,000 psi. All development and splice lengths are to conform to EM 1110-2-2104 and ACI 318-99.

STRUCTURAL STEEL

10. Structural steel used in bars, plates and shapes is ASTM A36 with the minimum yield stress, f_y taken as 36,000 psi. Steel design is to conform to EM 1110-2-2105, Design of Hydraulic Steel Structures and AISC LRFD, 2nd Ed.

STEEL SHEETPILE WALLS

11. Steel Sheetpiling, where applicable, to be designed according to EM 1110-2-2504, Design of Sheet Pile walls, and to conform to the requirements of ASTM A328 having a yield stress (Fy) of 38,500 psi. The maximum allowable stress conforms to the requirements of EM 1110-1-2101

ALUMINUM

12. Aluminum used in the design is assumed to be Alloy 6061, temper T6. Allowable stresses are in conformance with EM 1110-1-2101 and the Aluminum Design Manual.

UNIT WEIGHTS

13. Material unit weights (other than soil) are as follows:

Reinforced Concrete:	γ_c = 150 pcf
Water:	γ_w = 62.5 pcf
Steel:	γ_s = 490 pcf
Aluminum:	γ_{al} = 169 pcf

FROST PROTECTION

14. All foundations are placed a minimum depth of 7.00 feet below ground surface to avoid problems with frost.

DESIGN AND ANALYSIS OF STRUCTURAL FEATURES

BOX CULVERTS AND BRIDGE STRUCTURES

15. Box Culvert Structures will be placed where the diversion channel crosses Highway 9 and 210th Avenue (CSAH 63). The structures are composed of 3 box culverts and a retaining wall on each corner. Each precast concrete box culvert is 12 feet high, 12 feet wide and 56 feet long. Each retaining wall is made of reinforced concrete and is approximately 20 feet deep, 2.0 feet thick and 46 feet long. The bottom of the wall footing is placed 7.00 feet below the invert of the culvert. There is a cut off wall under each end of the box culverts. The cut off walls are 6 feet deep and 1 foot thick. This structure is modeled using similar structure designed for Marshall, MN, Stage 2, Flood Control, constructed in 1999. See structural plate no. 1.

16. Box Culverts that installed under the road will be designed according to EM 1110-2-2902, Conduits, Culvert and Pipes and ACPA Concrete Pipe Handbook guidelines. Also Minnesota Department of Transportation guidelines for box culvert highway design will apply.

17. The Retaining Walls are T-walls. Design procedure for T-walls will be according to EM 1110-2-2502 for load and load combination determinations and stability analyses, and EM 1110-2-2104 for reinforced concrete design. For T-wall, load Cases R1 and R2 will be the only load cases investigated and only long-term soil conditions (drained condition) will be analyzed. Water elevations on both sides will be taken to the top of the wall for Load Case R2. The design flood elevation will be used for Load Case R1 and is an average of about 3.0 feet below top of wall elevations on the soil side and no water in the channel on the channel side. The bottom of the base slab is embedded 7.00 feet

below the ground surface for frost protection. The water elevation on the road side of the wall is taken at the top of soil elevation.

18. T-Walls will be analyzed for rotation, bearing, and sliding stability. Sliding stability will be evaluated for the inclined and block wedge conditions. Wall thicknesses will be obtained from factored pressures from the top of the wall with no resisting loads. Slab thicknesses will be obtained from factored bearing pressures.

19. The water table is estimated to be 7 feet above the bottom of T-Wall and dewatering should be required for construction of the Box Culverts and T-Wall.

GATEWELL CONTROL STRUCTURES

20. Gatewell gravity Control Structures are used to control flow of water within the flood-protected areas. There are nine gate wells. The structures are single-bay reinforced concrete box-shaped structures. Flows are controlled by sluice gates and aluminum stop logs secondary closures. They are sized based on past experience with similar structures. See Structural Plate no. 2 for top elevation, invert elevation, pipe diameter and sluice gate size for each structure.

21. Each control structure is of reinforced concrete founded on reinforced concrete slab. The structure will be analyzed for bearing and flotation stability and primary members will be sized using preliminary design procedures. Two load conditions will be considered, water to top of walls with uniform uplift, and normal gravity flow operation. Structural members will be designed assuming flat plate behavior where applicable, otherwise beam behavior will be assumed. Gravity flow conduits will be designed using EM 2902.

22. The design of control structure will follow criteria provided in EM 1110-2-3104 (for loading conditions and stability criteria), EM 1110-2-2502 (for determining soil loads), and EM 1110-2-2104 (for reinforced concrete design).

23. Future designs will optimize member sizes and will evaluate additional gravity flow needs through consultation with Mechanical-Electrical Engineering and Hydraulic Engineering.

MISCELLANEOUS DRAINAGE FEATURES

24. Drainage pipes and outlet and inlet pipes are precast concrete and are assumed to be a Class 4 design. Future designs will follow EM 1110-2-2902 and ACPA Concrete Pipe Handbook guidelines.

SANITARY SEWER LIFT STATIONS

25. Two sanitary sewer pump stations are planned. Pump stations constructed of a vertical 8 foot diameter reinforced concrete pipe (manhole) is planned. Design will conform to EM 1110-2-2902, ACI 318-02, and the ACPA Concrete Pipe Handbook, as applicable.

COMPUTATIONS

26. No computations are included but initial calculations for sizing structural components and calculations for similar structures from other projects are available upon request.

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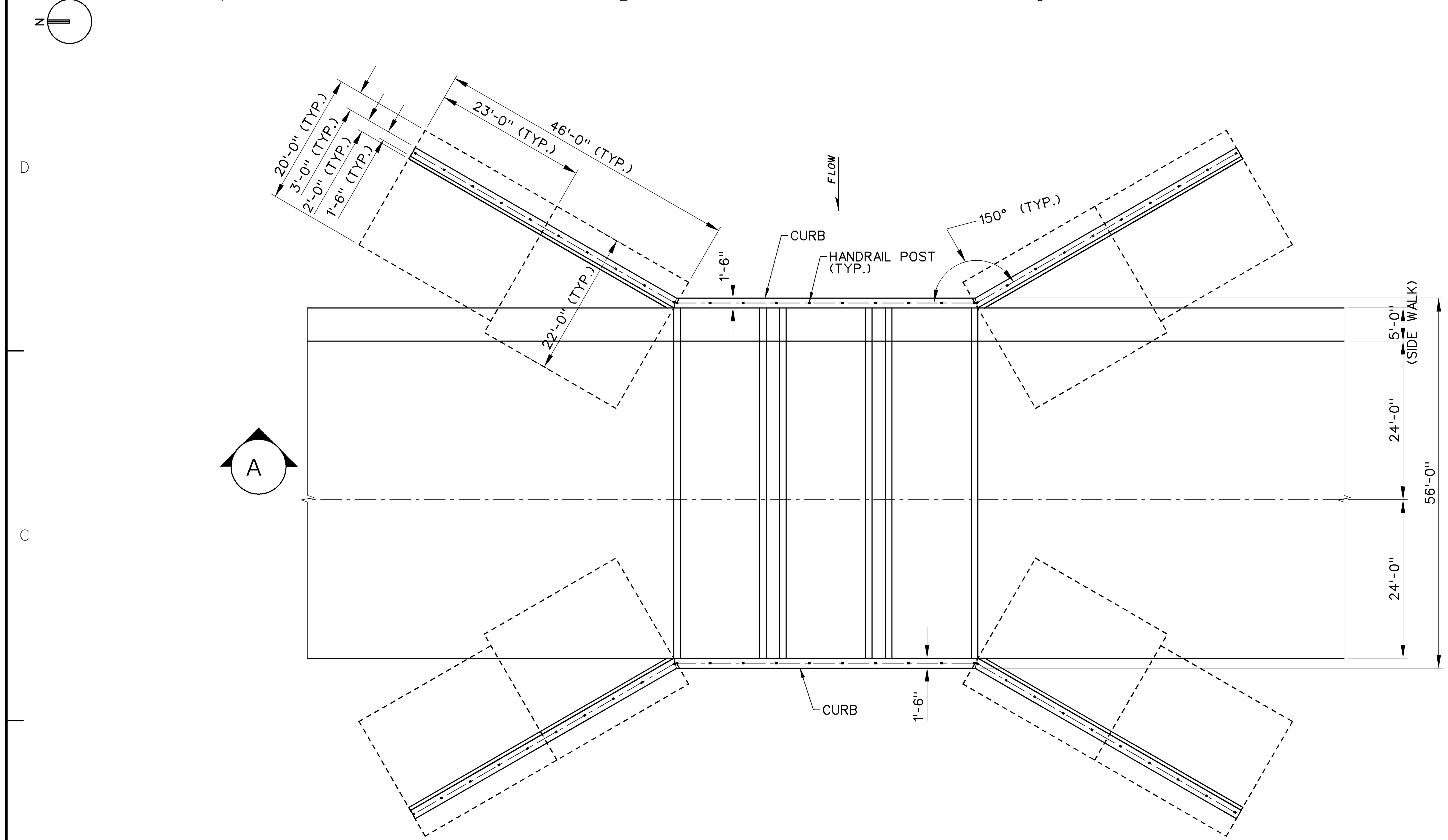
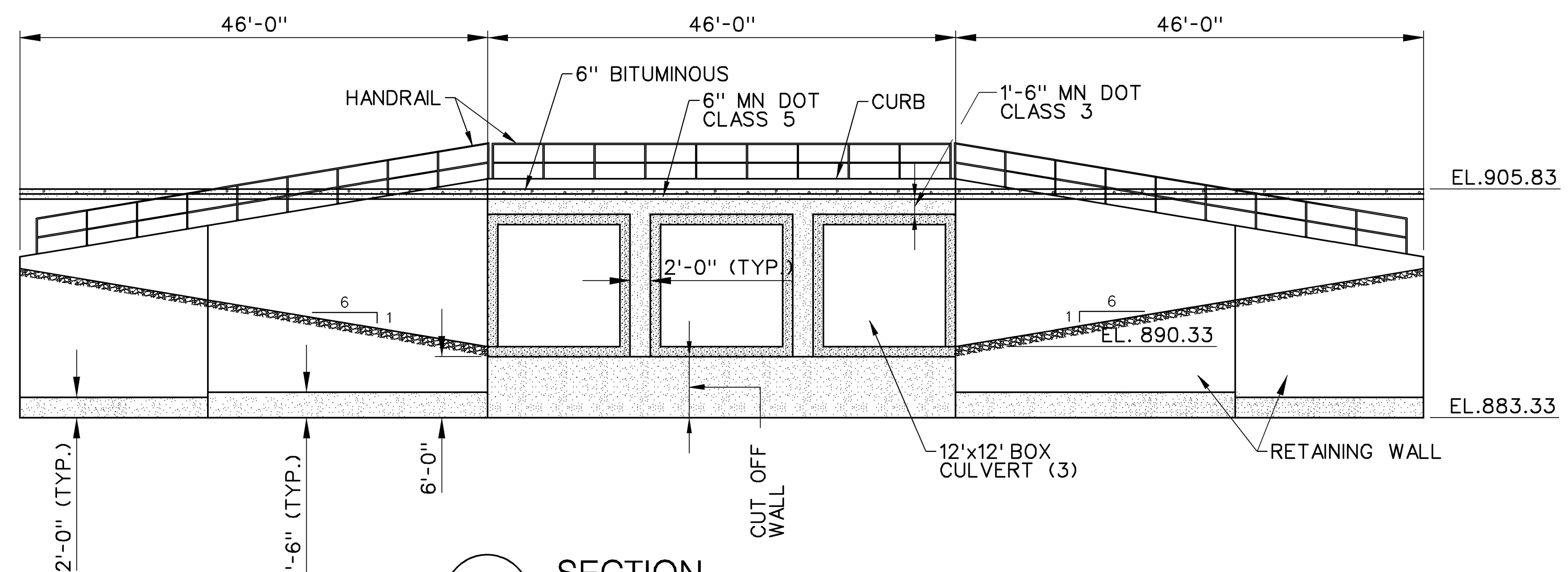


PLAN VIEW
WHY 9 BOX CULVERTS
SCALE: $\frac{3}{32}$" = 1'-0"



A SECTION
HWY 9 BOX CULVERTS
SCALE: $\frac{3}{32}$" = 1'-0"

SCALE: $\frac{3}{32}$" = 1'-0"

US Army Corps of Engineers
St. Paul District

Symbol	Description	Date	Appr.

DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT
CORPS OF ENGINEERS
ST. PAUL, MINNESOTA

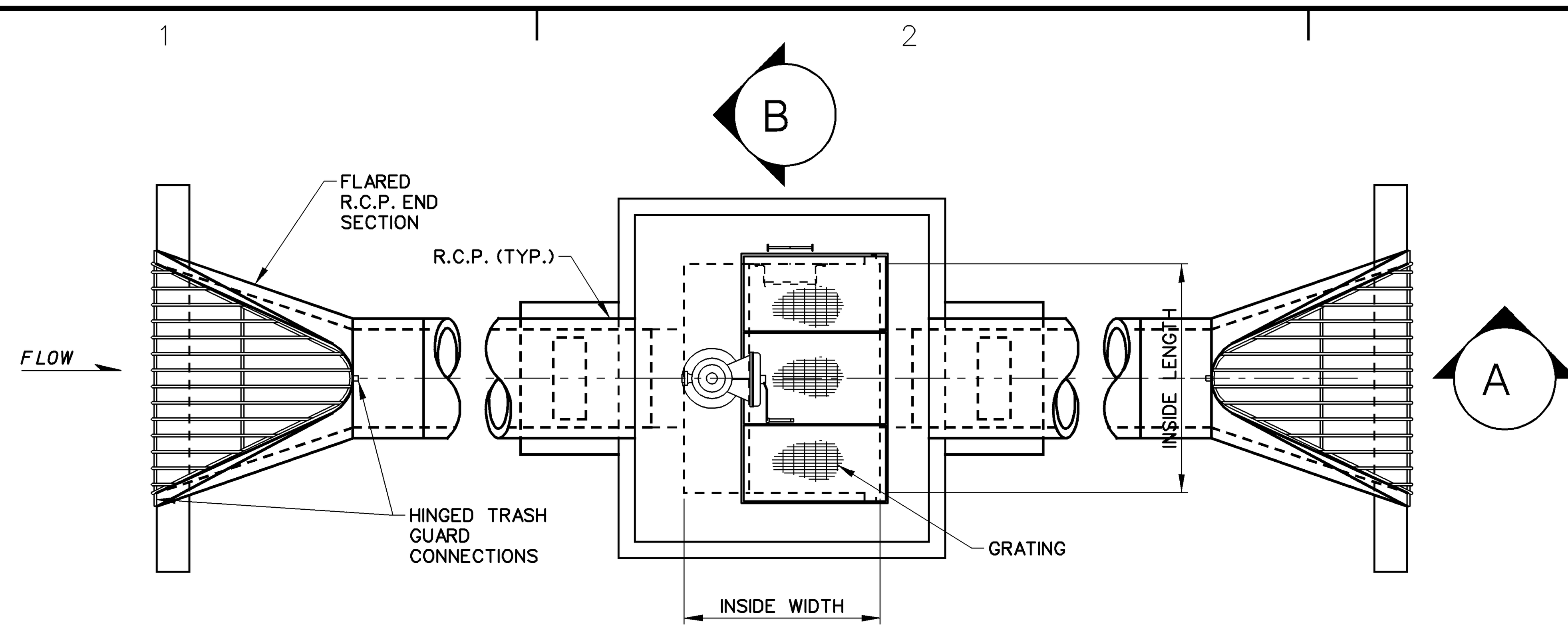
Horizontal Coordinate System:
UTM ZONE 15
NAD 1983, US SURVEY FT
Vertical Coordinate System:
MSL NGVD 1912 (ADJ)

Designed by: TSF		Date: FEBRUARY 2008	Rev.
Dwn by: NK	Ckd by:	Solicitation No.: DACW37-YR-B-0000	
Authority: PROJECT AUTHORITY		Drawing Number: R-PR-P-CD/000	
File Name: ADA07S401___S-401---.DGN			
Plot Scale: AS SHOWN		Plot Date:	

FEASIBILITY STUDY
ADA SECTION 205
WILD RICE & MARSH RIVERS - ADA, MINNESOTA
ADA, MINNESOTA

BOX CULVERTS BRIDGE
PLAN VIEW
AND SECTION

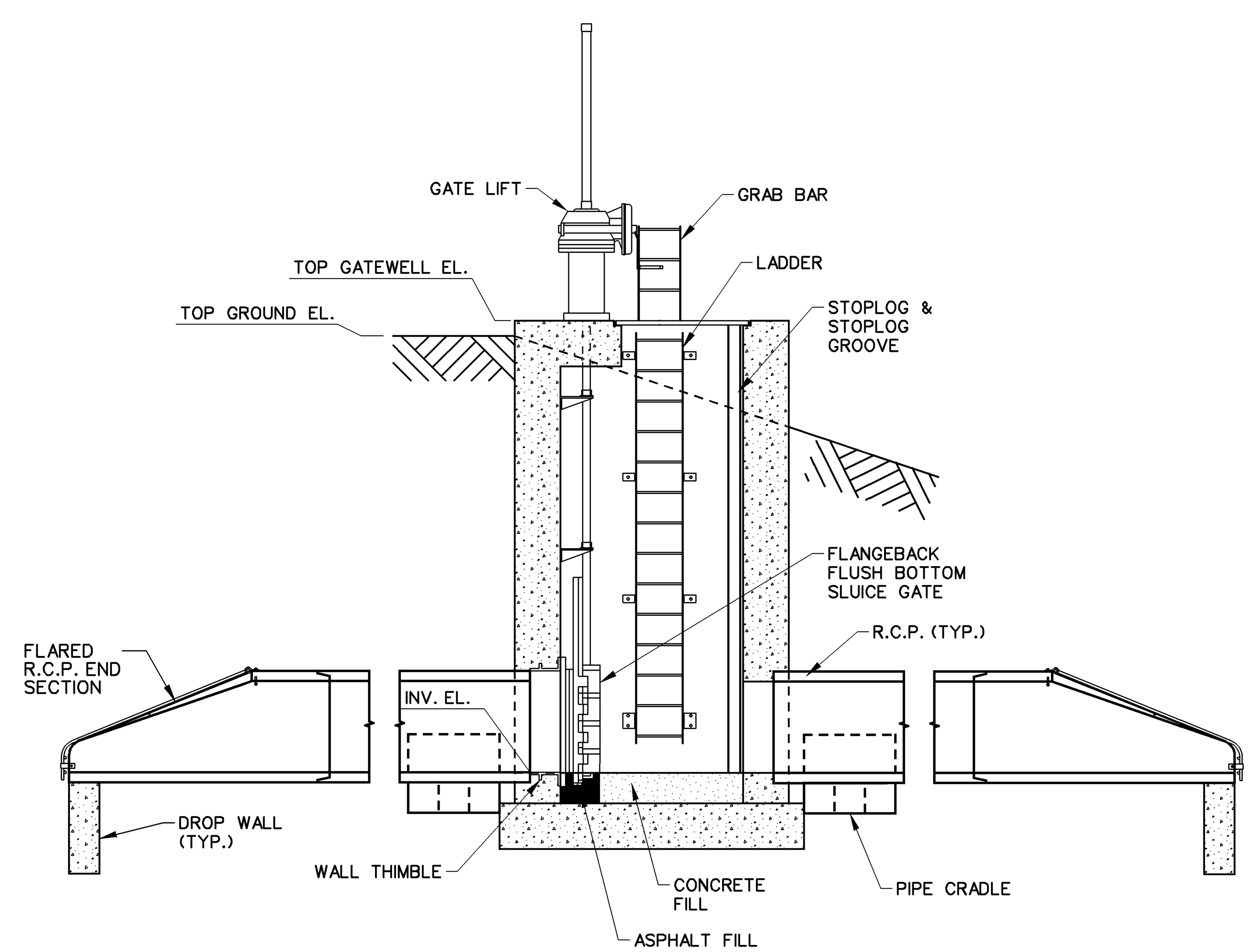
Sheet reference number:
S-001
Sheet 1 of 2



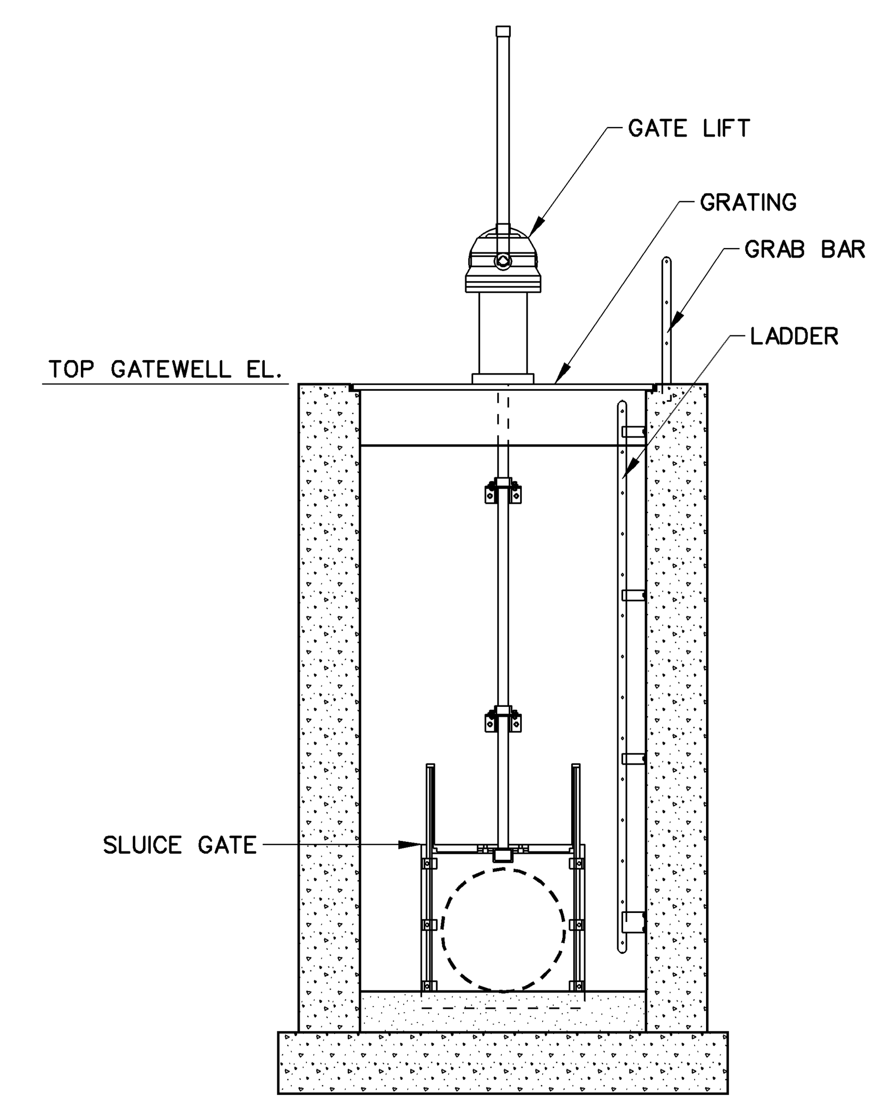
PLAN VIEW
CONTROL STRUCTURE
SCALE: NONE

CONTROL STRUCTURES

STRUCTURES	INV. EL.	TOP GROUND EL.	TOP GATE WELL EL.	HEIGHT (FT)	RCP DIA. (IN)	GATEWELL INSIDE WIDTH (FT)	GATEWELL INSIDE LENGTH (FT)	WATER TABLE ELEVATION
GATEWELL 1	889.59	905.83	906.33	17.24	48	7	5	890.80
MANHOLE	891.62	903.00	903.50	12.38	36	6	5	891.0
GATEWELL 2	894.68	901.73	902.23	8.05	36	6	5	895.60
GATEWELL 3	896.36	902.50	904.00	8.14	36	6	5	895.60
GATEWELL 4	898.43	902.74	905.74	7.81	36	6	5	895.60
GATEWELL 5	893.76	902.63	904.13	10.87	54	8	5	895.60
GATEWELL 6	895.29	897.00	902.50	7.71	36	6	5	895.60
GATEWELL 7	897.27	904.54	905.04	8.27	36	6	5	895.60
GATEWELL 8	899.08	905.71	906.21	7.63	36	6	5	895.60
GATEWELL 9	901.17	907.38	908.88	7.71	36	6	5	893.60



A SECTION
CONTROL STRUCTURE
SCALE: NONE



B SECTION
CONTROL STRUCTURE
SCALE: NONE

4' 2' 0 4'
SCALE: 1/4" = 1'-0"

US Army Corps of Engineers
St. Paul District

Symbol	Description	Date	Appr.

DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT
CORPS OF ENGINEERS
ST. PAUL, MINNESOTA

Horizontal Coordinate System:
UTM ZONE 15
NAD 1983, US SURVEY FT
Vertical Coordinate System:
MSL NGVD 1912 (ADJ)

Designed by: TSF
Date: FEBRUARY 2008
Rev.
Dwn by: NK
Ckd by:
Solicitation No.: DACW37-YR-B-0000
Authority: PROJECT AUTHORITY
Drawing Number: R-PR-P-CD/000
File Name: ADA07S402____S-402---.DGN
Plot Scale: AS SHOWN
Plot Date:

FEASIBILITY
ADA SECTION 205
WILD RICE & MARSH RIVERS - ADA, MINNESOTA
ADA, MINNESOTA

CONTROL STRUCTURE
PLAN VIEW
AND SECTIONS

Sheet reference number:
S-002
Sheet 2 of 2

SECTION 205 FEASIBILITY REPORT

ADA, MINNESOTA

WILD RICE AND MARSH RIVERS, MINNESOTA

APPENDIX E

HTRW ANALYSIS

Appendix E

Update to HTRW Assessment for the Proposed Flood Control Project At Ada, Minnesota

HTRW UPDATE

The initial Phase One Environmental Site Assessment (ESA) for the Ada, Minnesota 205 Flood control Feasibility Study was conducted By Earth Tech, Inc. in August 2000 under contract DACW37-99-D-0005 task order No. 3 and was titled

Phase I Environmental Site Assessment Ada, Minnesota Section 205 Feasibility Study August 2000

This update is a review of the phase one, with the additional information gained from several field trips to the area. Since the phase one was completed the project study area has grown with additional levees to the northwest and west of town. On 7 July 2006 a field trip was made to the City of Ada to reevaluate the ESA recommendations and evaluate the new project areas. The levee 8 reach, new road between Hwy. 9 and West Main, and the JD-51 reach (see plate E-1) have the highest potential for encountering contamination.

New Road between Hwy. 9 and West Main

Along the north portion of the Implement dealer property there were unmarked drums, vehicle storage and lead acid batteries. There is a chance that contamination will be encountered in this portion of the reach.

Levee 1Reach

Levee area 1, including ponding area, and drainage ditch, is agricultural land and poses no identifiable hazards.

Levee 2 Reach

Levee 2 is to be constructed in residential / agricultural / multiuse land. The farm implement dealer (see photo E-1) located in that reach has an above ground fuel storage tank and 55-gallon drums on the premises. The drums were located approximately 300-feet from the proposed alignment. There is a slight chance that contamination will be encountered in this portion of the reach. The rest of the reach encompassing the Fair Grounds and residential area, poses little chance of encountering contamination.

Levee 3 Reach

Levee 3 is bordered by residential properties and the golf course. In this reach there is little chance of encountering contamination.

Levee 8 Reach

In this reach there are several automotive maintenance shops or former automotive maintenance shops (see photo E-2 through E-5). It was observed that there were fuel tanks, drums, stored vehicles and truck and auto parts stored in the area around these facilities. The scope of work in this reach would involve only minor striping of top soil, there is a chance that contamination could be encountered in this area.

Levee 7 / JD51 Reach

This reach runs through agricultural land but is also adjacent to the Norman County Highway Department maintenance facilities (see plate E-1). This facility is a Minnesota leaking underground storage site (LUST). Soil and groundwater contamination have been found at this site. Boring 00-2M encountered petroleum odor in the upper 5-feet soil (see plate E-1 for Boring location). The hydraulic gradient is to the west, so the contamination should be moving to the west. There is a risk of contaminants being encountered during construction of the new JD 51. Phase II borings in the proposed channel should be completed as soon as possible after rights of entry are obtained. There is a possibility the channel may have to move east in this area.

Other potential sources

Within the project area there may have been undocumented residential fuel tanks for home or out building heat, or above ground storage tanks for agricultural use. These sources should not impact the project.

Chemical wastes

Waste tires, unlabeled drums, ash pile, and open buckets of used oil filters were observed along reach 8 in the area of the automotive maintenance shops or former automotive maintenance shops. Tires and unlabeled drums were located in the northwest portion of the lot of farm implement dealer on Hwy 9 near where the new access road will be constructed. It was noted that pallets of fertilizer and unlabeled drums were left at the abandoned factory near the northeast end of levee 1.

Recommendations

Phase II borings and testing are recommended for the following areas. See map on plate E-1 for locations.

Levee 2 Reach

Behind the Implement dealer in the area of the proposed levee, two borings 4-foot in depth, testing for volatile organic compounds (VOCs), diesel range organics (DRO), and gasoline range organics (GRO).

Levee 8 Reach

Behind the automotive maintenance shops or former automotive maintenance shops in the area of the proposed levee, 6 borings 4-foot in depth, testing for volatile organic compounds (VOCs), diesel range organics (DRO), and gasoline range organics (GRO).

Levee 7 / JD51 Reach

Adjacent to the Norman County Highway Department maintenance facilities in the area of the proposed levee/ JD51 Ditch, 4 borings to elevation of the bottom of the proposed ditch, testing for volatile organic compounds (VOCs), diesel range organics (DRO), and gasoline range organics (GRO).

New Road between Hwy. 9 and West Main

Along the north portion of the Implement dealer property 2 borings 6-foot in depth, testing for volatile organic compounds (VOCs), diesel range organics (DRO), and gasoline range organics (GRO).

Photos

Levee 2 Reach

Barrels stored behind Implement dealer Photo E-1

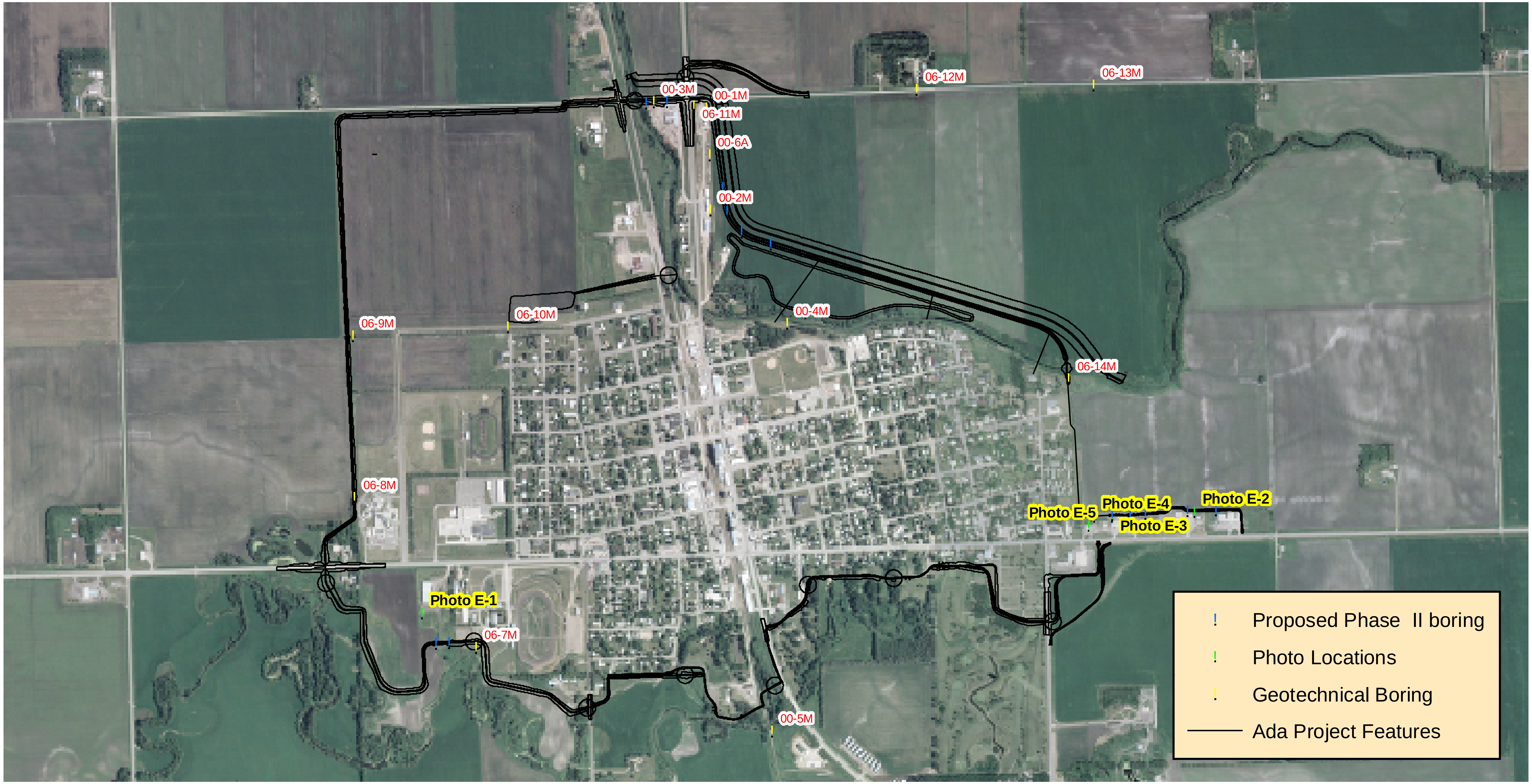
Levee 8 Reach

Barrels and vehicles along reach 8. Photo E-2

Tires tanks and barrels along reach 8. Photo E-3

Formerly used UST along reach 8. Photo E-4

Barrels, tires, and used filters along reach 8. Photo E-5



St. Paul District
GEOLOGY
GEOTECHNICAL

US Army Corps
of Engineers®

Ada Section 205

0 600 1,200 2,400 3,600 4,800
Feet

GIS/Geology/Ada_plate_E-1/KSN3-24-08

Plate E-1

SECTION 205 FEASIBILITY REPORT

ADA, MINNESOTA

WILD RICE AND MARSH RIVERS, MINNESOTA

APPENDIX F

ECONOMIC ANALYSIS

Appendix F

Economic Analysis

Ada, MN

Section 205 Feasibility Study

Introduction

The purpose of this analysis is to evaluate the economic feasibility of a variety of flood protection alternatives and identify the plan that maximizes contributions to national economic development (NED plan). The analysis follows the planning regulations laid out in ER 1105-2-100. Costs and benefits are referenced to October 2007 price levels, an interest rate of 4-7/8 percent is used for discounting and annualizing costs and benefits, and the project life is set at 50 years. A range of levee alternatives providing protection to the 50-year, 100-year, 200-year, and 500-year flood levels are considered in order to identify the NED plan, the plan with the greatest net benefits.

Demographic Characteristics

Population - The population of Ada as of the latest census (2000) was 1,657. This represents a continuation of population decline in recent decades. Population was 2,076 in 1970, 1,971 in 1980, and 1,708 in 1990. In contrast, the nearest MSA, Fargo, ND-Moorhead, MN, located 40 miles to the southwest, has experienced population growth in recent years increasing from 137,574 in 1980 to 174,367 in 2000.

Income - Per capita income for Norman County in 2005 was $27,414. This was lower than that for the state of Minnesota, $37,290 and for the nation as a whole, $34,471. Income growth since 1990 was also lower than state and national figures. From 1990 to 2005, per capita income for Norman County grew 56.0 percent while Minnesota’s per capita income grew 87.5 percent and that of the U.S. grew 77.0 percent.

Employment - The employment profile for Norman County is shown in Table 1. Figures for the State of Minnesota are presented also for perspective. Compared with state averages, the agricultural sector comprises a larger percentage of the local economy while manufacturing plays a much lesser role.

Table 1 - Employment by Industry (2005)				
Industry	Norman Co.	% of Total	Minnesota	% of Total
Farm employment	894	21.8%	100,539	2.9%
Forestry, fishing	*		14,094	0.4%
Mining	*		6,708	0.2%
Utilities	*		12,673	0.4%
Construction	*		200,591	5.7%
Manufacturing	10	0.2%	362,545	10.4%
Wholesale trade	119	2.9%	143,110	4.1%
Retail trade	396	9.7%	381,567	10.9%
Transportation & warehousing	*		108,389	3.1%
Information	126	3.1%	68,386	2.0%
Finance and insurance	204	5.0%	184,916	5.3%
Real Estate	94	2.3%	116,798	3.3%
Professional/technical services	119	2.9%	119,926	3.4%
Management	0	0.0%	64,510	1.8%
Administrative, waste services	*		165,371	4.7%
Educational services	> 10		71,854	2.1%
Health care, social assistance	500	12.2%	399,535	11.4%
Arts, entertainment, recreation	61	1.5%	72,726	2.1%
Accommodation, food services	*		218,673	6.3%
Other private services	260	6.3%	190,542	5.4%
Government	572	13.9%	415,134	11.9%
Total	4103	100.0%	3,498,587	100.0%
* Not shown to avoid disclosure of confidential information; estimates included in totals				
Source: BEA - Regional Economic Accounts				

Damage Analysis

Flood damages are evaluated using HEC's Flood Damage Analysis model (FDA). This model automates the process for calculating flood damages and benefits for flood damage reduction alternatives. While doing so it considers the uncertainty of data inputs and attempts to quantify the risk associated with the model results. Key inputs to the model include water surface profiles for a range of flood events, structure value and structure elevation data, depth-percent damage functions by type of structure, and levels of protection provided by alternatives. Input data includes both expected values and expressions of variability to account for uncertainty of data inputs.

Structure Inventory

The inventory of structures at Ada was updated in May 2006. Data collected for damage calculation purposes includes type of structure, location of structure, assessed market values, ground and first floor elevations, and an indication of whether or not the structure has a basement. Within the 500-year floodplain of Ada, the inventory includes 719 residential structures of which 494 have basements and 225 do not; 103 commercial properties; and 34 public units/categories including damage to streets and sewers and flood fight costs. Significant new construction since the flood of 1997 includes a new elementary/high school, hospital/nursing home complex, and a 31-unit senior citizen apartment building.

Structure Values

As directed by planning guidance, depreciated replacement value (DRV) serves as the basis for evaluating residential structure damage. These values are determined by revising upward the assessed market values (AMV) by a factor that reflects the difference between assessed market values and depreciated replacement values. These values are assigned to each structure based on a Marshall–Swift analysis of a sample of residential structures in Ada. The Marshall-Swift cost estimating procedure uses data on the physical characteristics of a residential structure to estimate its depreciated replacement value. Included among the factors affecting the value are the age and condition of the structure. A linear regression comparison between the assessed market values and the depreciated replacement values of the sample of structures yields the following equation:

$$DRV = \$34,828 + (1.056 * AMV); \text{ correlation coefficient } r = 0.960$$

This equation was used to change the assessed market value of each residential structure to its corresponding depreciated replacement value. As the DRV analysis was based on May 2006 assessed market values, a minor update to October 2007 price levels using ENR Building indices was required. After this update, the current average DRV for single unit residential structures is $94,800.

Hydrologic & Hydraulic Input

Hydrologic and hydraulic data input for the model includes water surface profiles for a range of eight frequency-specific flood events. These are the 2-, 5-, 10-, 20-, 50-, 100-, 200-, and 500-year events. The profiles include discharges associated with the flood events. From this data, the FDA model develops frequency-discharge and discharge-elevation (i.e., rating curves) relationships necessary for the calculation of average annual damages and benefits.

Due to the inherent uncertainty associated with the above relationships, confidence ranges are incorporated into the analysis. FDA creates the frequency-discharge curves using data from the water surface profiles. The expected discharge values and the confidence limits are derived analytically based on a 98-year record length. For example, the 95-percent confidence limits for a 10-year flow range from 3,910 cfs to 7,156 cfs and for a 100-year flow from 7,826 cfs to 20,935 cfs (see Table 2). For the rating curve, expected values for stages at given discharges are derived from the water surface profiles also. Uncertainty, expressed as values that are two standard deviations above and below the expected stage value, are provided as part of the hydraulic input for the analysis (see Table 3).

Flood Damage Categories

Residential - The primary benefit of a project at Ada is the reduction in damage caused by flooding of the Wild Rice River. Flood damage occurs to residential, commercial, and public properties. Damage to residential properties includes physical damage to the structure and contents. Residential structure damage is based primarily on depth of flooding and value of the structure. Depth of flooding is estimated by comparing the structure elevation with the elevation of the particular flood at the structure’s location as defined by the water surface profile. Standardized depth-percent damage relationships developed by the Corps of Engineers are used to estimate the value of both structure and content damage to a residential structure for a given flood event.

Table 2 - Frequency - Discharge Relationship and Variability

		Confidence Limit Curves (standard error)							
		Discharge (cfs)							
Frequency	Expected Discharge	-2 SD	% Difference From Expected	-1 SD	% Difference From Expected	+1 SD	% Difference From Expected	+2 SD	% Difference From Expected
0.2	3,580	2,723	-23.9%	3,122	-12.8%	4,105	14.7%	4,706	31.5%
0.1	5,290	3,910	-26.1%	4,548	-14.0%	6,153	16.3%	7,156	35.3%
0.04	7,912	5,379	-32.0%	6,524	-17.5%	9,595	21.3%	11,636	47.1%
0.02	10,200	6,564	-35.6%	8,182	-19.8%	12,715	24.7%	15,851	55.4%
0.01	12,800	7,826	-38.9%	10,009	-21.8%	16,370	27.9%	20,935	63.6%
0.004	16,567	9,542	-42.4%	12,573	-24.1%	21,829	31.8%	28,763	73.6%
0.002	19,800	10,936	-44.8%	14,715	-25.7%	26,643	34.6%	35,850	81.1%

Table 3 - Elevation-Discharge Relationships and Variability							
				75% Chance of Exceedence		25% Chance of Exceedence	
Reach 1a, 2a					Difference		Difference
	Discharge	Modal	Mean		from Mean		from Mean
Frequency	(cfs)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
50.0%	1,500	896.40	896.80	896.41	0.39	897.34	0.54
20.0%	3,580	898.90	899.20	898.76	0.44	899.55	0.35
10.0%	5,290	899.50	900.20	899.64	0.56	900.68	0.48
5.0%	7,240	900.10	901.30	900.48	0.82	902.05	0.75
2.0%	10,200	903.10	902.90	902.15	0.75	903.60	0.70
1.0%	12,800	903.15	903.50	903.02	0.48	903.99	0.49
0.5%	15,600	903.20	903.70	903.21	0.49	904.14	0.44
0.2%	19,800	904.60	905.40	904.82	0.58	905.95	0.55
Reach 1b, 2b							
50.0%	1,500	893.70	894.20	893.79	0.41	895.06	0.86
20.0%	3,580	897.50	897.50	897.17	0.33	897.90	0.40
10.0%	5,290	897.80	898.50	898.02	0.48	898.90	0.40
5.0%	7,240	898.20	899.60	898.68	0.92	900.38	0.78
2.0%	10,200	898.90	900.70	899.45	1.25	901.63	0.93
1.0%	12,800	900.20	901.40	900.47	0.93	902.26	0.86
0.5%	15,600	901.40	902.30	901.57	0.73	902.93	0.63
0.2%	19,800	904.00	904.30	904.00	0.30	904.51	0.21
Reach 3, 4							
50.0%	1,500	892.30	892.90	892.44	0.46	894.11	1.21
20.0%	3,580	897.30	897.10	896.79	0.31	897.37	0.27
10.0%	5,290	897.50	897.90	897.63	0.27	898.13	0.23
5.0%	7,240	897.60	898.50	897.96	0.54	898.95	0.45
2.0%	10,200	898.70	899.40	898.71	0.69	900.02	0.62
1.0%	12,800	899.80	900.20	899.72	0.48	900.65	0.45
0.5%	15,600	900.70	901.10	900.63	0.47	901.47	0.37
0.2%	19,800	901.70	902.10	901.71	0.39	902.38	0.28

Damage is assumed to begin at the structure with the lowest ground elevation at a given river mile reference point along the profile. If this structure has a basement, it is assumed that flood waters entering the basement will backup into other basements connected at that river mile location. Thus it is possible for a residential structure with a basement to be damaged before it physically comes into contact with flood waters.

Another significant source of damage to residential properties, as documented by a post-flood survey at Grand Forks/East Grand Forks after the 1997 flood, is other flood related costs. These consist of items such as cleanup costs, additional lodging, food, and travel costs incurred if evacuation from the residence is necessary, vehicle damage, medical costs, etc. These other costs start when the basement is about half flooded and they can grow to approximately 20 percent of the value of the residence as the first floor becomes significantly inundated.

Commercial - Commercial property damage consists of physical damage to commercial structures and contents and cleanup costs. It does not include business revenue losses. Damage to commercial structures is calculated by applying general depth-percent damage figures to the value of the commercial structure. The depth-damage relationships are specific for the type of business evaluated. Separate depth-percent damage relationships are used for calculating content damages as well.

Public - Public damage includes physical damage to public buildings and its contents, other public infrastructure such as streets and sewers, and flood fight costs. Like commercial damage calculation, general depth-percent damage relationships are used to calculate damages to public structures and contents when appropriate. For unique public facilities for which a general relationship does not exist, a depth-damage relationship is developed and used as input for the model. Actual damage figures from recent flood event, particularly the 1997 event, provide useful data to develop these relationships.

Flood Damages - Without-Project Condition

Emergency levees were constructed during the 1997 flood and have been modified in subsequent flood events. Geotechnical engineers have performed an analysis to determine the level of credit to assign the existing levee in terms of its capability to prevent flood damage. Their conclusion is that no credit should be assigned to the levees. This is primarily due to unstable soil conditions at selected points along the levee alignment.

As an interim step in the process of evaluating average annual damages, FDA produces elevation-damage relationships for given reaches. Table 4 below displays these relationships by damage category by reach.

Table 4 – Elevation-Damage Relationships by Category by Reach				
Reach 1a				
Stage	Residential	Commercial	Public	Total
898.0	$18,800	$1,200	-	$20,000
899.0	47,000	1,700	$2,600	51,300
900.0	114,700	2,000	45,400	162,100
901.0	228,100	2,300	145,700	376,100
902.0	650,000	2,600	207,000	859,600
903.0	1,748,400	3,000	275,000	2,026,400
905.0	5,529,400	6,600	381,400	5,917,400
907.0	9,615,800	14,500	394,600	10,024,900
Reach 1b				
Stage	Residential	Commercial	Public	Total
897.0	-	$4,400	-	$4,400
898.0	-	9,300	-	9,300
899.0	$22,500	17,800	$3,200	43,500
900.0	93,700	22,400	50,700	166,800
901.0	299,300	31,800	163,600	494,700
902.0	711,300	74,900	260,400	1,046,600
904.0	1,603,200	280,800	599,600	2,483,600
906.0	2,724,700	629,800	920,500	4,275,000

Reach 2a				
Stage	Residential	Commercial	Public	Total
898.0	-	-	-	-
899.0	-	-	$2,300	$2,300
900.0	-	-	38,400	38,400
901.0	$3,800	-	123,300	127,100
902.0	84,400	-	175,200	259,600
903.0	250,200	-	232,800	483,000
905.0	1,177,500	-	322,800	1,500,300
907.0	2,164,400	$9,700	372,700	2,546,800
Reach 2b				
Stage	Residential	Commercial	Public	Total
897.0	$5,100	$2,000	$4,600	$11,700
898.0	32,200	2,700	32,500	67,400
899.0	138,000	3,600	55,200	196,800
900.0	216,700	7,100	108,900	332,700
901.0	488,700	57,500	275,500	821,700
902.0	986,700	188,700	516,000	1,691,400
904.0	1,991,700	451,200	1,053,700	3,496,600
906.0	3,394,500	946,300	1,670,500	6,011,300
Reach 3				
Stage	Residential	Commercial	Public	Total
895.0	$8,900	$28,800	-	$37,700
896.0	50,400	43,900	-	94,300
897.0	170,800	58,800	-	229,600
898.0	461,200	77,200	$5,200	543,600
899.0	835,600	90,500	88,500	1,014,600
900.0	2,580,900	119,100	285,500	2,985,500
901.0	5,893,200	312,900	435,300	6,641,400
903.0	11,257,700	1,275,700	1,131,600	13,665,000
905.0	15,632,700	1,763,300	1,821,300	19,217,300

Reach 4				
Stage	Residential	Commercial	Public	Total
895.0	$8,900	-	-	$8,900
896.0	41,600	-	-	41,600
897.0	108,600	-	-	108,600
898.0	246,200	$2,800	$800	249,800
899.0	464,700	12,100	14,000	490,800
900.0	1,324,500	28,300	44,900	1,397,700
901.0	2,354,800	47,800	67,800	2,470,400
903.0	4,953,700	98,300	217,400	5,269,400
905.0	6,796,700	122,600	383,500	7,302,800

FDA integrates the elevation-damage, elevation-discharge, and frequency-discharge relationships to derive a frequency-damage relationship and ultimately average annual damages for the without project condition. Tables 5 and 6 display flood damages by category for selected flood events and a summary of average annual damages by damage category.

Table - 5 - Ada, MN - Flood Damage for Selected Flood Events by Category by Reach					
		Damage by Selected Flood Event			
Reach	Category	50-Year	100-Year	250-Year	500-Year
1a	Residential	2,095,000	3,399,000	5,035,200	5,467,000
	Commercial	18,000	30,000	43,900	48,000
	Public	329,000	534,000	791,200	859,000
	Total	2,442,000	3,963,000	5,870,300	6,374,000
1b	Residential	382,000	933,000	1,518,200	1,912,000
	Commercial	93,000	204,000	371,100	467,000
	Public	150,000	327,000	596,200	751,000
	Total	625,000	1,464,000	2,485,500	3,130,000
2a	Residential	326,000	558,000	799,900	856,000
	Commercial	-	-	-	-
	Public	284,000	486,000	696,600	745,000
	Total	610,000	1,044,000	1,496,500	1,601,000
2b	Residential	617,000	1,242,000	2,064,800	2,599,000
	Commercial	99,000	198,000	329,700	415,000
	Public	334,000	673,000	1,118,600	1,408,000
	Total	1,050,000	2,113,000	3,513,100	4,422,000

3	Residential	2,002,000	4,521,000	8,261,500	9,591,000
	Commercial	338,000	764,000	1,395,400	1,620,000
	Public	134,000	303,000	553,500	643,000
	Total	2,474,000	5,588,000	10,210,400	11,854,000
4	Residential	1,157,000	2,093,000	3,777,900	4,408,000
	Commercial	20,000	37,000	66,500	78,000
	Public	27,000	48,000	87,400	102,000
	Total	1,204,000	2,178,000	3,931,800	4,588,000
Grand Total	Residential	6,579,000	12,746,000	21,457,500	24,833,000
	Commercial	568,000	1,233,000	2,206,600	2,628,000
	Public	1,258,000	2,371,000	3,843,500	4,508,000
	Total	8,405,000	16,350,000	27,507,600	31,969,000

Table 6 - Average Annual Damage Without Project Condition

	Residential	Commercial	Public	Total
Average annual damage	$ 556,200	$ 53,000	$ 94,800	$ 704,000

With-Project Condition

Preliminary Screening – Four alternatives were considered for analysis early in the planning process. These were referred to as Alternatives 1 – 4. The differences among them primarily consisted of the alignment of JD 51. Selection was based solely on costs as each plan would produce similar level of benefits. The costs for each alternative were estimated as: $8,532,000 for Alternative 1; $6,377,000 for Alternative 2; $4,333,000 for Alternative 3; and $4,767,000 for Alternative 4. These costs are relative in that they do not include costs for features common to each alternative. Alternative 3, being the least costly, was selected as the alternative to carry forward for further analysis.

Flood Damages - Four levee/diversion channel alternatives were evaluated in an effort to optimize the level of protection from an economic standpoint. The alternatives vary by level of protection that they offer: 50-year, 100-year, 200-year, and 500-year protection levels. The projects are sized such that they contain the design flood with a 90-95 percent probability. Table 7 displays average annual damages with the different alternatives in place.

Table 7 - Average Annual Damage for With-Project Conditions				
Level of	Average Annual Damage (x 1,000)			
Protection	Residential	Commercial	Public	Total
50-Year	$119,100	$13,300	$24,700	$157,100
100-Year	64,800	7,800	14,800	87,500
200-Year	33,200	3,800	7,600	44,600
500-Year	700	100	100	900

Project Benefits

Flood Damage Reduction – Flood damage reduction benefits are the difference between flood damages for the without-project condition compared with the with-project condition. Table 8 displays the average annual flood damage reduction benefits and the percent damage reduction for the alternatives under consideration.

Table 8 - Average Annual Benefits by Alternative			
Condition	Average Annual Damage	Average Annual Benefit	% Damage Reduction
Without Project	$704,000		
50-Year protection	157,100	$546,900	77.70%
100-Year protection	87,500	616,500	87.60%
200-Year protection	44,600	659,400	93.70%
500-Year protection	900	703,100	99.87%

Flood Insurance Cost Savings - For those alternatives that provide 100-year level of flood protection or greater, property owners would no longer be required to purchase flood insurance. By eliminating these policies, a benefit occurs to the nation in the form of a saving of the costs to administer these policies. Currently, 29 flood insurance policies are in effect at Ada. At an annual saving of $191 per policy, this benefit amounts to $5,600. This benefit can be claimed for the 100-year, 200-year, and 500-year projects, but not the 50-year project.

Floodproofing Cost Savings – A minor benefit that can be claimed by removing an area out of the 100-year flood plain is the saving of the cost to floodproof new construction. According to city officials new construction is occurring in the floodplain at an average rate of 2 units per year. This area is located in the northwest corner of town platted as the Cougar Addition. These units are floodproofed either by raising them on fill or by building the homes with poured concrete basements. In either case the low entry point for floodwater into the home is at or above the 100-year flood level. Floodproofing adds an average of $10,000 to the cost of constructing a home in the floodplain. There are 36 lots available for future development to which this benefit can be applied. The annualized equivalent of the present value of the floodproofing cost savings benefit amounts to $12,700. This is calculated as follows.

Calculation of Floodproofing Cost Savings Benefit

Savings per year (2 units x $10,000/unit)	$ 20,000
NPV factor (Present worth of $1 per period; 4-7/8% for 18 years)	11.8046
NPV of Total Savings (Savings/year x NPV factor)	236,092
Interest & Amortization Factor (4-7/8% over 50 years)	0.053722
Average Annual Benefit (NPV Total Svgs x Int & Amort factor)	12,683

Benefit Summary - Table 9 presents a summary of benefits by alternative

Table 9 - Summary of Benefits by Alternative

Category	50-Yr Levee	100-Yr Levee	200-Yr Levee	500-Yr Levee
Flood damage reduction	$546,900	$616,500	$659,400	$703,100
Floodproofing cost savings		12,700	12,700	12,700
Flood insurance savings		5,600	5,600	5,600
Total Avg Ann Benefits	546,900	634,800	677,700	721,400

Average Annual Costs

Computation of average annual costs appears below. Interest during construction is included based on a one-year construction schedule. Costs are amortized at 4-7/8 percent over a 50-year project life.

Table - Calculation of Average Annual Costs by Alternative

	50-Yr Levee	100-Yr Levee	200-Yr Levee	500-Yr Levee

Project Costs	6,840,000	7,270,000	7,670,000	8,910,000
Interest During Const *	164,741	175,098	184,732	214,597
Total Investment	7,004,741	7,445,098	7,854,732	9,124,597
Int & Amort Factor	0.05372	0.05372	0.05372	0.05372
Avg Ann Investment	376,295	399,951	421,956	490,173
Avg Ann O&M	25,286	27,107	28,741	32,552
Total Avg Ann Costs	401,581	427,058	450,697	522,725
* Based on one year construction schedule				

Benefit – Cost Ratio

Table 11 presents a summary of average annual benefits and costs. Each of the alternatives is economically feasible. Planning regulations direct that the project with the greatest net benefits be selected as the plan to be recommended for implementation. This is the NED plan, the plan that maximizes net economic benefits. Of the plans considered in this analysis the 200-year plan has the greatest net benefits and is therefore the NED plan.

Table 11 - Summary of Benefits, Costs, BCR's, Net Benefits				
	50-Yr Levee	100-Yr Levee	200-Yr Levee	500-Yr Levee
Average Annual benefits	$546,900	$634,800	$677,700	$721,400
Average Annual Costs	401,581	427,058	450,697	522,725
Benefit-Cost Ratio	1.36	1.49	1.50	1.38
Net Benefits	145,319	207,742	227,003	198,675

Project Performance

Given the uncertainty associated with the various hydraulic, hydrologic, and economic relationships used in the flood damage analysis, there is likewise some uncertainty regarding a project's ability to provide a given level of protection. FDA measures a project's performance by calculating the probability that flood stages will exceed the project's capacity. The project is generally designed so that there is a 90-95 percent probability it contains the design flood. Table 12 shows the probability that the 200-year levee project will contain selected flood levels. For example, the levee in Reaches 1a and 2a will contain the 100-year flood (1% event) with a probability of 98.61 percent. Because of the ranges of uncertainty, the 200-year project also has the ability to contain the 500-year flood (probability of 81.68 percent). On the other hand, there is some risk that the project may not necessarily contain the 200-year flood. There is still a 2.47 percent probability (1 – 0.9753) that the 200-year flood will overtop the 200-year project in Reaches 3 and 4.

Table 12 - Probability of Levee Overtop by Event

	Top of Levee	Conditional Non-Exceedence Probability by Events				
Reach	Elevation	4.0%	2.0%	1.0%	0.5%	0.2%
1a, 2a	906.2	0.9995	0.9994	0.9861	0.9084	0.8168
1b, 2b	904.4	0.9998	0.9965	0.9618	0.7706	0.547
3, 4	903.7	0.9999	0.9999	0.9989	0.9753	0.9126

In addition to considering the probability of a particular event overtopping a levee as above, one can consider the probability of a levee being overtopped over a given period of time (say 10, 25, or 50 years). Table 13 presents project performance in this manner for the 200-year levee in each Reach. Based on the data presented in the table, the levee along Reaches 1b and 2b will have a 6.91 percent chance of being overtopped within a period of 25 years. As the period of time increases in length, the probability for an overtopping event for the levee increases.

Table 13 – Long-term Risk of 200-Year Levee Alternative

	Expected Annual Probability of Design	Probability of Exceedance Over Indicated Time Period		
Reach	Being Exceeded	10 Years	25 Years	50 Years

1a, 2a	0.000	0.0090	0.0223	0.0440
1b, 2b	0.003	0.0282	0.0691	0.1335
3, 4	0.001	0.0032	0.0081	0.0161

Another measure of project performance is to consider the probability that the BCR of the project will be above 1.0. The following two tables provide information upon which to consider this. Table 14 contains output derived from the FDA model and shows, for each levee alternative, the probability of attaining a given level of damage reduction benefits. For instance, for the 100-year plan there is a 75-percent chance that the project will generate damage reduction benefits exceeding $323,560. These can be compared with the level of benefits needed to justify costs (Column 3). Based on the data presented, the probability of attaining the amount of damage reduction benefits needed to justify the costs lies between 50 and 75 percent for each of the levee alternatives.

Table 14 - Probability of Attaining Minimum Required Benefits					
		FDR Benefits	Probabilities That FDR Benefits		
Levee	Avg Ann	Needed to	Exceed Indicated Values		
Alternative	Costs	Justify Costs*	0.75	0.50	0.25
50-Year	$ 401,600	$ 401,600	$ 305,890	$ 473,880	$ 711,190
100-Year	427,100	408,800	323,560	528,080	803,300
200-Year	450,700	432,400	331,170	544,030	870,520
500-Year	522,700	504,400	341,640	562,410	914,610
* Difference between this figure and costs is Other Benefits (flood insurance cost savings					
and floodproofing cost savings = $18,300)					

Table 15 is derived from Table 14 and shows the probability of a levee alternative achieving a BCR of the indicated level. For example, the 100-year levee has a 50-percent chance of exceeding a BCR of 1.29. The table also shows the probability of the BCR exceeding the feasibility threshold of 1.0. This is calculated as a straight interpolation between the probability values of 0.5 and 0.75 of achieving a BCR of 1.0. For example, the probability of the 200-year levee attaining a BCR >1 is 63 percent. This is the interpolation between a BCR of 0.76 (at 75-percent probability) and a BCR of 1.26 (at 50-percent probability).

Table 15 - Expected and Probabilistic Value of Benefit-Cost Ratios

			Probabilities that Benefit-Cost Ratio		
	Expected	Probability	Exceeds Indicated Values		
Alternative	Value of BCR	BCR > 1.0	0.75	0.50	0.25
50-Year	1.36	0.61	0.76	1.18	1.77
100-Year	1.49	0.64	0.79	1.29	1.96
200-Year	1.50	0.63	0.76	1.26	2.01
500-Year	1.38	0.56	0.68	1.11	1.81

Incremental Option Areas

Three separate areas adjacent to the Ada city limits are considered for inclusion within the protected area of the proposed 200-year levee. These are referred to as the East, West, and Northwest Option Areas. The East Option Area is located along Hwy 200 east of Ada and consists of several businesses. The West Option Area is along the west edge of Ada and consists of two farmsteads on either side of Hwy 200. The Northwest Option Area consists of open land currently in agricultural production northwest of Ada's city limits. For purposes of this economic analysis, future land use in this area within the period of analysis is not projected to change.

An economic analysis was performed to determine if it is feasible to add these areas as incremental components to the basic 200-year flood risk management plan. Results of this analysis are summarized in Table 16 below. (Note: Cost for the basic 200-year plan differs from the estimate that appears in Table 10 for the alternatives analysis due to further refinement of itemized costs.)

Due to construction efficiencies, adding the West and Northwest Option Areas to the basic 200-year plan actually result in lower overall project costs. Therefore, on an incremental basis, it is economically feasible to add these features to the basic 200-year plan. The East Option Area costs the same to build as the basic plan. Given the minor level of additional benefits expected for the East Option Area, it makes sense to add this feature to the basic plan as well. In conclusion, the three Option Areas are incrementally justified as additional features to the basic 200-year flood risk management alternative for Ada, Minnesota.

Table 16 - Economic Summary of Adding Option Areas to 200-year Levee Plan			
	200-Year Levee Plan plus Option Area		
	East	West	Northwest
First cost	$ 7,670,000	$ 7,660,000	$ 7,650,000
First cost - Basic 200-yr levee	7,670,000	7,670,000	7,670,000
Incremental Cost	0	(10,000)	(20,000)
Avg Ann Incremental Cost	0	(537)	(1,074)
Avg Ann O&M	28,700	28,700	28,700
Avg Ann O&M - Basic 200-yr levee	28,700	28,700	28,700
Avg Ann Incremental O&M	0	0	0
Total Avg Ann Incremental Cost	0	(537)	(1,074)
Avg Ann Incremental Benefit	10 - 100	1,350	> 0
Incremental BCR	> 1.0	> 1.0	> 1.0

SECTION 205 FEASIBILITY REPORT

ADA, MINNESOTA

WILD RICE AND MARSH RIVERS, MINNESOTA

APPENDIX G

ALTERNATIVES SCREENING COST ESTIMATE

	Units	Unit Price	Alternate 1 Quantity	Alternate 1 Amount	Alternate 2 Quantity	Alternate 2 Amount	Alternate 3 Quantity	Alternate 3 Amount	Alternate 4 Quantity	Alternate 4 Amount
Total Project Cost				8,532,000		6,377,000		4,333,000		4,767,000
				1.00		0.75		0.51		0.56
I 5										
Lands and Damages				3,527,702		1,940,552		68,250		198,739
Levee 4				1,626,000						
Industrial	LOT	6,000.00	25.00	150,000						
Agricultural	AC	1,500.00								
Residential	AC	17,424.00								
Improvements										
Garage	EA	10,000.00	15.00	150,000						
Residential	EA	75,000.00	13.00	975,000						
Relocations										
Owner	EA	27,000.00	13.00	351,000						
Tenant	EA	7,000.00								
Levee 5						38,850				
Industrial	LOT	6,000.00								
Agricultural	AC	1,500.00			25.90	38,850				
Residential	AC	17,424.00								
Improvements										
Garage	EA	10,000.00								
Residential	EA	75,000.00								
Relocations										
Owner	EA	27,000.00								
Tenant	EA	7,000.00								
Levee 6				1,901,702		1,901,702				
Industrial	LOT	6,000.00								
Agricultural	AC	1,500.00								
Residential	AC	17,424.00	12.15	211,702	12.15	211,702				
Improvements										
Garage	EA	10,000.00								
Residential	EA	75,000.00	16.00	1,200,000	16.00	1,200,000				
Relocations										
Owner	EA	27,000.00	14.00	378,000	14.00	378,000				
Tenant	EA	7,000.00	16.00	112,000	16.00	112,000				
Levee 7								68,250		32,055.00
Industrial	LOT	6,000.00								
Agricultural	AC	1,500.00					45.50	68,250	21.37	32,055.00
Residential	AC	17,424.00								
Improvements										
Garage	EA	10,000.00								
Residential	EA	75,000.00								
Relocations										
Owner	EA	27,000.00								
Tenant	EA	7,000.00								
Remote JD51										50,235.00

	Units	Unit Price	Alternate 1 Quantity	Alternate 1 Amount	Alternate 2 Quantity	Alternate 2 Amount	Alternate 3 Quantity	Alternate 3 Amount	Alternate 4 Quantity	Alternate 4 Amount
Total Project Cost				8,532,000		6,377,000		4,333,000		4,767,000
				1.00		0.75		0.51		0.56
Industrial	LOT	6,000.00								
Agricultural	AC	1,500.00							33.49	50,235.00
Residential	AC	17,424.00								
Improvements										
Garage	EA	10,000.00								
Residential	EA	75,000.00								
Relocations										
Owner	EA	27,000.00								
Tenant	EA	7,000.00								
Damages Anticipated	AC	375.00							310.53	116,448.75
Relocations				56,875		6,000		4,000		4,000.00
Sanitary Sewer				30,000		0		0		0.00
8" PVC forcemain relocation	LF	80.00	360.00	28,800						
Valve	EA	300.00	4.00	1,200						
Water				16,875		0		0		0.00
6" PVC Waterline w/ Service Lines	LF	45.00	375.00	16,875						
Electricity				10,000		6,000		4,000		4,000.00
Required Pole Relocations	EA	1,000.00	10.00	10,000	6.00	6,000	4.00	4,000	4.00	4,000.00
Diversion Channels				2,575,998		3,623,009		3,715,708		4,018,805.20
JD 51				1,586,685		1,736,407		1,879,106		1,696,167.47
Topsoil, 4" & Seed	CY	16.00	16,214.40	259,430	15,858.38	253,734	15,353.57	245,657	14,097.58	225,561.30
BCY needed for levees from JD51 Excavatio	BCY	6.00	110,419.86	662,519	108,805.79	652,835	115,773.21	694,639	115,773.21	694,639.23
BCY excess from JD51 Excavation	BCY	5.25	126,616.30	664,736	158,064.48	829,839	178,820.88	938,810	147,803.23	775,966.94
Water Control	LS	50,000.00	4.00	200,000	3.00	150,000	2.00	100,000	1.00	50,000.00
Erosion Protection at Existing Ditch	LS	200,000.00			1.00	200,000	1.00	200,000	1.00	200,000.00
Transition Structure at 210the street	LS	200,000.00							1.00	200,000.00
Control Structure Downstream Old Ditch				0		101,413		101,413		101,412.72
Site Preparation										
Structural Excavation	CY	6.00			426.67	2,560	426.67	2,560	426.67	2,560.00
Backfill Material from Excavation	CY	7.00			534.07	3,739	534.07	3,739	534.07	3,738.52
Base Slab Concrete										
Forms	SF	8.00			48.00	384	48.00	384	48.00	384.00
Reinforcing	LBS	0.45			757.01	341	757.01	341	757.01	340.65
Concrete	CY	150.00			5.33	800	5.33	800	5.33	800.00
Finished Surface (Float Finish)	SF	1.00			144.00	144	144.00	144	144.00	144.00
Curing Surface	SF	0.50			144.00	72	144.00	72	144.00	72.00
Construction Joint Surface Treatment	SF	2.00			28.00	56	28.00	56	28.00	56.00
Wall Concrete										
Forms	SF	12.00			980.00	11,760	980.00	11,760	980.00	11,760.00
Reinforcing	LBS	0.50			3,148.19	1,574	3,148.19	1,574	3,148.19	1,574.10
Concrete	CY	220.00			16.67	3,667	16.67	3,667	16.67	3,666.67
Curing Surface	SF	0.50			456.00	228	456.00	228	456.00	228.00
Construction Joint Surface Treatment	SF	2.00			21.00	42	21.00	42	21.00	42.00

Total Project Cost				8,532,000		6,377,000		4,333,000		4,767,000
				1.00		0.75		0.51		0.56
			Alternate 1		Alternate 2		Alternate 3		Alternate 4	
	Units	Unit Price	Quantity	Amount	Quantity	Amount	Quantity	Amount	Quantity	Amount
Elevated Slab Concrete										
Forms	SF	12.00			22.50	270	22.50	270	22.50	270.00
Reinforcing	LBS	0.45			129.33	58	129.33	58	129.33	58.20
Concrete	CY	250.00			0.83	208	0.83	208	0.83	208.33
Finish Top Surface, Steel Trowel	SF	1.00			22.50	23	22.50	23	22.50	22.50
Curing Surface	SF	0.50			22.50	11	22.50	11	22.50	11.25
RCP Pipes										
60" Diam RCP Pipe, class 4	LF	245.00			100.00	24,500	100.00	24,500	100.00	24,500.00
60" Diam RCP Pipe End Section, class 4	Each	1,200.00			2.00	2,400	2.00	2,400	2.00	2,400.00
Gratings										
Grating, serrated	SF	4.00			24.50	98	24.50	98	24.50	98.00
Framing Angle, Steel, Galvanized	LB	1.00			196.00	196	196.00	196	196.00	196.00
Headed Studs, Welded to Framing Angle, 3/8"	EA	4.00			20.00	80	20.00	80	20.00	80.00
Ladder, Wall Mounted or Vertical Grab Bars										
Galvanized Steel Ladder bolted to Concrete	LF	45.00			20.00	900	20.00	900	20.00	900.00
1/2" Anchor Bolts, x 5"	EA	12.00			14.00	168	14.00	168	14.00	168.00
Sluice Gate										
60"x60" Sluice Gates	Each	40,000.00			1.00	40,000	1.00	40,000	1.00	40,000.00
Stoplog Panel and grooves										
4x6x1/4-5.5ft long aluminum tube stoplogs	EA	65.00			35.00	2,275	35.00	2,275	35.00	2,275.00
Sill Chanel and frame, Galvanized steel	LB	1.00			237.50	238	237.50	238	237.50	237.50
Anchors, 16" long	EA	10.00			6.00	60	6.00	60	6.00	60.00
1/2" Anchor Bolts, x 5"	EA	12.00			26.00	312	26.00	312	26.00	312.00
Fence										
6' high fence	LF	15.00			30.00	450	30.00	450	30.00	450.00
Personnel gate, 3.5' wide	EA	200.00			1.00	200	1.00	200	1.00	200.00
Fence										
Hwy guardrail	LF	45.00			80.00	3,600	80.00	3,600	80.00	3,600.00
Precast Box Culverts Structure 210th St. for field access				0		0		0		336,036.17
Site Preparation										
Structural Excavation	CY	6.00							0.00	
Backfill Material from Excavation	CY	7.00							0.00	
Drainage Material Between Box Culverts	CY	25.00							82.96	2,074.07
Precast Box Culverts and Walls										
12'x12' box culverts 85 ft long each	FT	1,500.00							75.00	112,500.00
RC Concrete cut off walls	CY	250.00							18.74	4,685.19
RC Concrete Wing wall's slab	CY	200.00							302.22	60,444.44
RC Concrete Wing wall's wall	CY	250.00							201.48	50,370.37
Cut off wall reinforcement	LBS	0.55							1,825.29	1,003.91
Slabs reinforcement	LBS	0.55							20,260.13	11,143.07
Wing walls reinforcement	LBS	0.65							18,232.48	11,851.11
Slab's formwork	SF	**8.00**							1,608.00	12,864.00
Walls' formwork	SF	**12.00**							4,640.00	55,680.00

Total Project Cost				8,532,000		6,377,000		4,333,000		4,767,000
				1.00		0.75		0.51		0.56
			Alternate 1		Alternate 2		Alternate 3		Alternate 4	
	Units	Unit Price	Quantity	Amount	Quantity	Amount	Quantity	Amount	Quantity	Amount
Handrail										
Handrail galvanized 1.5" Diam. Pipes	LBS	2.00							1,760.00	3,520.00
Hwy Guardrail	LF	45.00							220.00	9,900.00
Precast Box Culverts Structure 210th St				0		695,876		695,876		695,875.90
Site Preparation										
Structural Excavation	CY	6.00			8,533.33	51,200	8,533.33	51,200	8,533.33	51,200.00
Backfill Material from Excavation	CY	7.00			5,200.00	36,400	5,200.00	36,400	5,200.00	36,400.00
Drainage Material Between Box Culverts	CY	25.00			311.11	7,778	311.11	7,778	311.11	7,777.78
Precast Box Culverts and Walls										
12'x12' box culverts 85 ft long each	FT	1,500.00			255.00	382,500	255.00	382,500	255.00	382,500.00
RC Concrete cut off walls	CY	250.00			18.74	4,685	18.74	4,685	18.74	4,685.19
RC Concrete Wing wall's slab	CY	200.00			302.22	60,444	302.22	60,444	302.22	60,444.44
RC Concrete Wing wall's wall	CY	250.00			201.48	50,370	201.48	50,370	201.48	50,370.37
Cut off wall reinforcement	LBS	**0.65**			1,825.29	1,186	1,825.29	1,186	1,825.29	1,186.44
Slabs reinforcement	LBS	0.55			20,260.13	11,143	20,260.13	11,143	20,260.13	11,143.07
Wing walls reinforcement	LBS	0.45			18,232.48	8,205	18,232.48	8,205	18,232.48	8,204.62
Slab's formwork	SF	8.00			1,608.00	12,864	1,608.00	12,864	1,608.00	12,864.00
Walls' formwork	SF	12.00			4,640.00	55,680	4,640.00	55,680	4,640.00	55,680.00
Handrail										
Handrail galvanized 1.5" Diam. Pipes	LBS	2.00			1,760.00	3,520	1,760.00	3,520	1,760.00	3,520.00
Hwy Guardrail	LF	45.00			220.00	9,900	220.00	9,900	220.00	9,900.00
Precast Box Culverts Structure located under hwy 9				789,313		739,313		739,313		739,312.94
Site Preparation										
Remove existing box culverts/bridge	Job	50,000.00	1.00	50,000						
Structural Excavation	CY	**6.00**	9,481.48	56,889	9,481.48	56,889	9,481.48	56,889	9,481.48	56,888.89
Backfill Material from Excavation	CY	7.00	10,444.44	73,111	10,444.44	73,111	10,444.44	73,111	10,444.44	73,111.11
Drainage Material Between Box Culverts	CY	**25.00**	352.59	8,815	352.59	8,815	352.59	8,815	352.59	8,814.81
Precast Box Culverts and Walls										
12'x12' box culverts 85 ft long each	FT	**1,500.00**	255.00	382,500	255.00	382,500	255.00	382,500	255.00	382,500.00
RC Concrete cut off walls	CY	**250.00**	18.74	4,685	18.74	4,685	18.74	4,685	18.74	4,685.19
RC Concrete Wing wall's slab	CY	**200.00**	302.22	60,444	302.22	60,444	302.22	60,444	302.22	60,444.44
RC Concrete Wing wall's wall	CY	**250.00**	201.48	50,370	201.48	50,370	201.48	50,370	201.48	50,370.37
Cut off wall reinforcement	LBS	**0.65**	1,825.29	1,186	1,825.29	1,186	1,825.29	1,186	1,825.29	1,186.44
Slabs reinforcement	LBS	0.55	20,260.13	11,143	20,260.13	11,143	20,260.13	11,143	20,260.13	11,143.07
Wing walls reinforcement	LBS	0.45	18,232.48	8,205	18,232.48	8,205	18,232.48	8,205	18,232.48	8,204.62
Slab's formwork	SF	8.00	1,608.00	12,864	1,608.00	12,864	1,608.00	12,864	1,608.00	12,864.00
Walls' formwork	SF	**12.00**	4,640.00	55,680	4,640.00	55,680	4,640.00	55,680	4,640.00	55,680.00
Handrail										
Handrail galvanized 1.5" Diam. Pipes	LBS	2.00	1,760.00	3,520	1,760.00	3,520	1,760.00	3,520	1,760.00	3,520.00
Hwy Guardrail	LF	45.00	220.00	9,900	220.00	9,900	220.00	9,900	220.00	9,900.00
Levees and Floodwalls				432,812		260,256		287,143		287,147.51
Levee 4 Ring				179,370		0		0		0.00
Excavation	CY	5.00	0.00							

	Units	Unit Price	Alternate 1 Quantity	Alternate 1 Amount	Alternate 2 Quantity	Alternate 2 Amount	Alternate 3 Quantity	Alternate 3 Amount	Alternate 4 Quantity	Alternate 4 Amount
Total Project Cost				8,532,000		6,377,000		4,333,000		4,767,000
				1.00		0.75		0.51		0.56
Levee Fill	CY	3.00	32,509.63	97,529						
Stripping	CY	3.00	5,875.92	17,628						
Topsoil, 4" & Seed	CY	16.00	4,013.31	64,213						
Levee 5				0		154,382		0		0.00
Excavation	CY	5.00			0.00					
Levee Fill	CY	**3.00**			31,093.78	93,281				
Stripping	CY	**3.00**			4,384.04	13,152				
Topsoil, 4" & Seed	CY	**16.00**			2,996.80	47,949				
Levee 6				18,683		18,683		0		0.00
Excavation	CY	**5.00**	0.00		0.00					
Levee Fill	CY	**3.00**	1,061.35	3,184	1,061.35	3,184				
Stripping	CY	**3.00**	1,121.60	3,365	1,121.60	3,365				
Topsoil, 4" & Seed	CY	16.00	758.36	12,134	758.36	12,134				
Levee 7				0		0		199,952		199,952.30
Excavation	CY	5.00					0.00		0.00	
Levee Fill	CY	**3.00**					38,266.90	114,801	38,266.90	114,800.70
Stripping	CY	**3.00**					6,112.71	18,338	6,112.71	18,338.14
Topsoil, 4" & Seed	CY	16.00					4,175.84	66,813	4,175.84	66,813.46
Raised West Main Road / Levee #4				205,985		0		0		0.00
Excavation	CY	5.00	0.00							
Roadway Fill	CY	3.00	5,542.46	16,627						
Stripping	CY	3.00	4,188.52	12,566						
Topsoil, 4" & Seed	CY	16.00	1,356.36	21,702						
2" Wear Course Volume	CY	40.00	738.53	29,541						
4" Base Course Volume	CY	40.00	1,477.05	59,082						
12" Underlayment Volume	CY	15.00	4,431.16	66,467						
IntersectionHwy 9 & 210th Ave.				28,774		87,191		87,191		87,195.21
Excavation	CY	5.00					0.00		0.00	
Roadway Fill	CY	3.00	3,044.14	9,132	9,224.67	27,674	9,224.67	27,674	9,224.67	27,674.01
Stripping	CY	**3.00**	653.70	1,961	1,980.91	5,943	1,980.91	5,943	1,980.91	5,942.74
Topsoil, 4" & Seed	CY	**16.00**	326.93	5,231	990.69	15,851	990.69	15,851	990.69	15,851.09
2" Wear Course Volume	CY	40.00	59.29	2,371	179.63	7,185	179.63	7,185	179.65	7,186.17
4" Base Course Volume	CY	40.00	118.57	4,743	359.27	14,371	359.27	14,371	359.31	14,372.33
12" Underlayment Volume	CY	15.00	355.72	5,336	1,077.81	16,167	1,077.81	16,167	1,077.92	16,168.87
Interior Flood Control				1,938,166		546,792		258,231		258,230.72
Ada Pump Station				894,683						
Site Preparation										
Structural Excavation	CY	6.00	502.52	3,015						
Backfill Material from Excavation	CY	7.00	837.78	5,864						
Base Slab Concrete										
Forms	SF	8	216.00	1,728						
Reinforcing	TN	800.00	0.00							
Concrete	CY	**150.00**	57.78	8,667						

			Alternate 1		Alternate 2		Alternate 3		Alternate 4	
Total Project Cost				8,532,000		6,377,000		4,333,000		4,767,000
				1.00		0.75		0.51		0.56
	Units	Unit Price	Quantity	Amount	Quantity	Amount	Quantity	Amount	Quantity	Amount
Finished Surface (Float Finish)	SF	**1.00**	780.00	780						
Curing Surface	SF	**0.50**	780.00	390						
Construction Joint Surface Treatment	SF	**2.00**	205.50	411						
Concrete fill (Lean Concrete)	CY	80.00	17.78	1,422						
Wall Concrete										
Forms	SF	12.00	5,355.00	64,260						
Reinforcing	TN	900.00	0.00							
Concrete	CY	220.00	122.50	26,950						
Curing Surface	SF	0.50	5,565.00	2,783						
Construction Joint Surface Treatment	SF	2.00	216.00	432						
Elevated Slab Concrete										
Forms	SF	12.00	776.00	9,312						
Reinforcing	TN	800.00	0.00							
Concrete	CY	250.00	24.89	6,222						
Finsih Top Surface, Steel Trowel	SF	1.00	780.00	780						
Curing Surface	SF	0.50	780.00	390						
RCP Pipes										
60" Diam RCP pipe, class 4	LF	245.00	160.00	39,200						
60" Diam flared end section and trash guard	Ea	1200	4.00	4,800						
Ladder, Wall Mounted or Vertical Grab Bars										
Ladder, Steel, 18" Wide, Bolted to Concrete	VLF	45	84.00	3,780						
Galvanized Steel	LB	0.65	420.00	273						
1/2" Anchor Bolts, x 5.25"	EA	12	40.00	480						
Fabricated Roof Hatch										
Hatches(2-4'x4.5', 2-3'x2.5', 2-3'x4')	EA	2000	6.00	12,000						
Stop Logs										
Extruded Aluminum Tube, 4"x6", 6' long, 70 stc	LB	5	2,520.00	12,600						
Neoprene Pads	SF	10	138.60	1,386						
Stop Logs Grooves and Sill										
Plates	LB	0.45	750.00	338						
Neoprene Pads	SF	10	18.00	180						
Stainless Anchors, 6" long	EA	40	104.00	4,160						
Fence										
6' high barbed wires fence	LF	15.00	112.00	1,680						
8' wide Fence Gate	EA	400.00	1.00	400						
Additional Items										
60"x60" Sluice Gates	EA	60,000.00	4.00	240,000						
Pumps., 5000 GPM Each	LS	150,000.00	2.00	300,000						
Interior Electrical work.	LS	60,000.00	1.00	60,000						
Other Pump Station Features	LS	50,000.00	1.00	50,000						
Power Supply	LS	30,000.00	1.00	30,000						
Storm Sewer System				925,375		310,574		140,122		140,121.96
Manhole/Catchbasin	EA	5,000.00	6.00	30,000	3.00	15,000				

Total Project Cost				8,532,000		6,377,000		4,333,000		4,767,000
				1.00		0.75		0.51		0.56
			Alternate 1		Alternate 2		Alternate 3		Alternate 4	
	Units	Unit Price	Quantity	Amount	Quantity	Amount	Quantity	Amount	Quantity	Amount
12" RCP	LF	24.00	79.93	1,918	79.93	1,918				
16" RCP	LF	36.00	512.58	18,453	307.80	11,081				
18" RCP	LF	50.00	805.97	40,299	805.97	40,299				
21" RCP	LF	66.00	1,365.18	90,102	1,097.18	72,414				
24" RCP	LF	88.00	712.07	62,662						
33" RCP	LF	**120.00**	616.36	73,963						
36" RCP	LF	**165.00**	1,004.77	165,787						
36" Flared End Section	EA	**500.00**	2.00	1,000	2.00	1,000				
Filled or Removed Storm Sewer	LF	25.00	1,636.25	40,906	668.39	16,710				
Culverts Crossing Levee	LF	88.00	209.04	18,395	72.34	6,366	77.04	6,779	77.04	6,779.52
Closure Structure	EA	118,108.76	3.00	354,326	1.00	118,109	1.00	118,109	1.00	118,108.76
Interior Culverts	LF	55.00	276.98	15,234	276.98	15,234	276.98	15,234	276.98	15,233.68
Replaced Culvert Length	LF	25.00	493.17	12,329	497.79	12,445				
Gatewell At (Sta:0+00.00) Invert Elev. 887.00				118,109		118,109		118,109		118,108.76
Site Preparation										
Structural Excavation	CY	6.00	426.67	2,560	426.67	2,560	426.67	2,560	426.67	2,560.00
Backfill Material from Excavation	CY	7.00	534.07	3,739	534.07	3,739	534.07	3,739	534.07	3,738.52
Base Slab Concrete				1,872		1,872		1,872		1,872.35
Forms	SF	8.00	48.00	384	48.00	384	48.00	384	48.00	384.00
Reinforcing	LBS	0.55	757.01	416	757.01	416	757.01	416	757.01	416.35
Concrete	CY	150.00	5.33	800	5.33	800	5.33	800	5.33	800.00
Finished Surface (Float Finish)	SF	1.00	144.00	144	144.00	144	144.00	144	144.00	144.00
Curing Surface	SF	**0.50**	144.00	72	144.00	72	144.00	72	144.00	72.00
Construction Joint Surface Treatment	SF	2.00	28.00	56	28.00	56	28.00	56	28.00	56.00
Wall Concrete				17,428		17,428		17,428		17,428.17
Forms	SF	12.00	980.00	11,760	980.00	11,760	980.00	11,760	980.00	11,760.00
Reinforcing	LBS	**0.55**	3,148.19	1,732	3,148.19	1,732	3,148.19	1,732	3,148.19	1,731.51
Concrete	CY	220.00	16.67	3,667	16.67	3,667	16.67	3,667	16.67	3,666.67
Curing Surface	SF	**0.50**	456.00	228	456.00	228	456.00	228	456.00	228.00
Construction Joint Surface Treatment	SF	**2.00**	21.00	42	21.00	42	21.00	42	21.00	42.00
Elevated Slab Concrete				583		583		583		583.22
Forms	SF	**12.00**	22.50	270	22.50	270	22.50	270	22.50	270.00
Reinforcing	LBS	**0.55**	129.33	71	129.33	71	129.33	71	129.33	71.13
Concrete	CY	**250.00**	0.83	208	0.83	208	0.83	208	0.83	208.33
Finish Top Surface, Steel Trowel	SF	**1.00**	22.50	23	22.50	23	22.50	23	22.50	22.50
Curing Surface	SF	0.50	22.50	11	22.50	11	22.50	11	22.50	11.25
RCP Pipes										
60" Diam RCP Pipe, class 4	LF	**245.00**	100.00	24,500	100.00	24,500	100.00	24,500	100.00	24,500.00
60" Diam RCP Pipe End Section, class 4	Each	**1,200.00**	2.00	2,400	2.00	2,400	2.00	2,400	2.00	2,400.00
Gratings										
Grating, serrated	SF	4.00	24.50	98	24.50	98	24.50	98	24.50	98.00
Framing Angle, Steel, Galvanized	LB	1.00	196.00	196	196.00	196	196.00	196	196.00	196.00
Headed Studs, Welded to Framing Angle, 3/8" Dia	EA	**4.00**	20.00	80	20.00	80	20.00	80	20.00	80.00

Total Project Cost				8,532,000		6,377,000		4,333,000		4,767,000
				1.00		0.75		0.51		0.56
			Alternate 1		Alternate 2		Alternate 3		Alternate 4	
	Units	Unit Price	Quantity	Amount	Quantity	Amount	Quantity	Amount	Quantity	Amount
Ladder, Wall Mounted or Vertical Grab Bars										
Galvanized Steel Ladder bolted to Concrete	LF	**45.00**	20.00	900	20.00	900	20.00	900	20.00	900.00
1/2" Anchor Bolts, x 5"	EA	**12.00**	14.00	168	14.00	168	14.00	168	14.00	168.00
Sluice Gate										
60"x60" Sluice Gates	Each	60,000.00	1.00	60,000	1.00	60,000	1.00	60,000	1.00	60,000.00
Stoplog Panel and grooves										
4x6x1/4-5.5ft long aluminum tube stoplogs	EA	**65.00**	35.00	2,275	35.00	2,275	35.00	2,275	35.00	2,275.00
Sill Chanel and frame, Galvanized steel	LB	1.00	237.50	238	237.50	238	237.50	238	237.50	237.50
Anchors, 16" long	EA	**10.00**	6.00	60	6.00	60	6.00	60	6.00	60.00
1/2" Anchor Bolts, x 5"	EA	**12.00**	26.00	312	26.00	312	26.00	312	26.00	312.00
Fence										
6' high fence	LF	15.00	30.00	450	30.00	450	30.00	450	30.00	450.00
Personnel gate, 3.5' wide	EA	**250.00**	1.00	250	1.00	250	1.00	250	1.00	250.00
GatewellAt (Sta:34+38.00) Invert Elev. 887.76				0		118,109		0		0.00
Site Preparation										
Structural Excavation	CY	**6.00**			426.67	2,560				
Backfill Material from Excavation	CY	**7.00**			534.07	3,739				
Base Slab Concrete										
Forms	SF	8.00			48.00	384				
Reinforcing	LBS	0.55			757.01	416				
Concrete	CY	150.00			5.33	800				
Finished Surface (Float Finish)	SF	**1.00**			144.00	144				
Curing Surface	SF	**0.50**			144.00	72				
Construction Joint Surface Treatment	SF	2.00			**28.00**	56				
Wall Concrete										
Forms	SF	**12.00**			980.00	11,760				
Reinforcing	LBS	**0.55**			3,148.19	1,732				
Concrete	CY	**220.00**			16.67	3,667				
Curing Surface	SF	**0.50**			456.00	228				
Construction Joint Surface Treatment	SF	**2.00**			21.00	42				
Elevated Slab Concrete										
Forms	SF	12.00			22.50	270				
Reinforcing	LBS	0.55			129.33	71				
Concrete	CY	250.00			0.83	208				
Finish Top Surface, Steel Trowel	SF	1.00			22.50	23				
Curing Surface	SF	0.50			22.50	11				
RCP Pipes										
60" Diam RCP Pipe, class 4	LF	245.00			100.00	24,500				
60" Diam RCP Pipe End Section, class 4	Each	1,200.00			2.00	2,400				
Gratings										
Grating, serrated	SF	4.00			24.50	98				
Framing Angle, Steel, Galvanized	LB	1.00			196.00	196				
Headed Studs, Welded to Framing Angle, 3/8" Dia	EA	4.00			20.00	80				

Total Project Cost				8,532,000		6,377,000		4,333,000		4,767,000
				1.00		0.75		0.51		0.56
			Alternate 1		Alternate 2		Alternate 3		Alternate 4	
	Units	Unit Price	Quantity	Amount	Quantity	Amount	Quantity	Amount	Quantity	Amount
Ladder, Wall Mounted or Vertical Grab Bars										
Galvanized Steel Ladder bolted to Concrete	LF	**45.00**			20.00	900				
1/2" Anchor Bolts, x 5"	EA	12.00			14.00	168				
Sluice Gate										
60"x60" Sluice Gates	Each	60,000.00			1.00	60,000				
Stoplog Panel and grooves										
4x6x1/4-5.5ft long aluminum tube stoplogs	EA	65.00			35.00	2,275				
Sill Chanel and frame, Galvanized steel	LB	1.00			237.50	238				
Anchors, 16" long	EA	10.00			6.00	60				
1/2" Anchor Bolts, x 5"	EA	12.00			26.00	312				
Fence										
6' high fence	LF	15.00			30.00	450				
Personnel gate, 3.5' wide	EA	250.00			1.00	250				
Planning, Engineering and Design	LS									

SECTION 205 FEASIBILITY REPORT

ADA, MINNESOTA

WILD RICE AND MARSH RIVERS, MINNESOTA

APPENDIX H

REAL ESTATE PLAN

SECTION 205 FEASIBILITY REPORT
ADA, MINNESOTA
REAL ESTATE PLAN

(the Real Estate Plan will be included in the Final Feasibility Report)

SECTION 205 FEASIBILITY REPORT

ADA, MINNESOTA

WILD RICE AND MARSH RIVERS, MINNESOTA

APPENDIX I

NED SCREENING COST ESTIMATE

ADA FLOOD DAMAGE REDUCTION PROJECT
NED ANALYSIS

	ADA FLOOD DAMAGE REDUCTION PROJECT					50 YEAR				100 YEAR				200 YEAR				200 YEAR WITH EAST OPTION				200 YEAR WITH WEST OPTION				200 YEAR WITH NORTHWEST OPTION				500 YEAR		
	NED Analysis		Unit Price			5,530,000	1,310,000	6,840,000		5,880,000	1,400,000	7,270,000		6,190,000	1,480,000	7,670,000		6,200,000	1,930,000	7,670,000		6,180,000	1,920,000	7,660,000		6,180,000	1,920,000	7,650,000		7,200,000	1,700,000	8,910,000
	Description of Work	Unit	Most Likely	Contingency %	Quantity	Amount	Contingency	Total	Quantity	Amount	Contingency	Total	Quantity	Amount	Contingency	Total	Quantity	Amount	Contingency	Total	Quantity	Amount	Contingency	Total	Quantity	Amount	Contingency	Total	Quantity	Amount	Contingency	Total
1	Lands and Damages	$$	1	15%	711,460	711,460	106,719	818,179	715,105	715,105	107,266	822,371	718,210	718,210	107,732	825,942	723,427	723,427	108,514	831,942	729,949	729,949	109,492	839,442	718,210	718,210	107,732	825,942	1,006,961	1,006,961	151,044	1,158,005
1																																
2	Relocations							83,866				104,335				105,961				105,969				105,870				105,902				109,753
2	Waterline, 1.25" PVC	LF	32	25%	225	7,200	1,800	9,000	225	7,200	1,800	9,000	225	7,200	1,800	9,000	225	7,200	1,800	9,000	225	7,200	1,800	9,000	225	7,200	1,800	9,000	225	7,200	1,800	9,000
2	Fiber Optic Cable	LF	10000	25%	1	10,000	2,500	12,500	1	10,000	2,500	12,500	1	10,000	2,500	12,500	1	10,000	2,500	12,500	1	10,000	2,500	12,500	1	10,000	2,500	12,500	1	10,000	2,500	12,500
2	Power Poles	EA	5000	25%	6	30,000	7,500	37,500	9	45,000	11,250	56,250	9	45,000	11,250	56,250	9	45,000	11,250	56,250	9	45,000	11,250	56,250	9	45,000	11,250	56,250	9	45,000	11,250	56,250
2	Unknown Relocations	LS	0.50%	25%	3,978,592	19,893	4,973	24,866	4,253,645	21,268	5,317	26,585	4,513,765	22,569	5,642	28,211	4,515,064	22,575	5,644	28,219	4,499,280	22,496	5,624	28,120	4,504,282	22,521	5,630	28,152	5,120,457	25,602	6,401	32,003
2																																
8	Roads, Railroads, and Bridges					1,158,618	289,655	1,448,273		1,260,322	315,081	1,575,403		1,379,036	344,759	1,723,796		1,379,036	344,759	1,723,796		1,379,036	344,759	1,723,796		1,379,036	344,759	1,723,796		1,484,664	371,166	1,855,830
8	Site Preparation					198,029	49,507	247,536		209,733	52,433	262,166		238,447	59,612	298,059		238,447	59,612	298,059		238,447	59,612	298,059		238,447	59,612	298,059		245,117	61,279	306,396
8	Top of Road	Elev			1,808				1,808				1,812				1,812				1,812				1,812				1,814			
8	Existing Ground Surface Elevation	Elev			1,802				1,802				1,802				1,802				1,802				1,802				1,802			
8	Bottom of Excavation Elevation	Elev			1,760				1,760				1,760				1,760				1,760				1,760				1,760			
8	Excavation for Box Culverts and wing	CY	6	25%	16,119	96,714	24,179	120,893	17,067	102,402	25,601	128,003	18,015	108,090	27,023	135,113	18,015	108,090	27,023	135,113	18,015	108,090	27,023	135,113	18,015	108,090	27,023	135,113	18,548	111,288	27,822	139,110
8	Side Slopes 1 Vertical to X Horizonta	Slope																														
8	Backfill Material	CY	7	25%	12,770	89,390	22,348	111,738	13,333	93,331	23,333	116,664	16,326	114,282	28,571	142,853	16,326	114,282	28,571	142,853	16,326	114,282	28,571	142,853	16,326	114,282	28,571	142,853	16,822	117,754	29,439	147,193
8	Drainage Material Between Box Culve	CY	25	25%	477	11,925	2,981	14,906	560	14,000	3,500	17,500	643	16,075	4,019	20,094	643	16,075	4,019	20,094	643	16,075	4,019	20,094	643	16,075	4,019	20,094	643	16,075	4,019	20,094
8																																
8	Precast Box Culverts and Walls					933,749	233,437	1,167,187		1,023,749	255,937	1,279,687		1,113,749	278,437	1,392,187		1,113,749	278,437	1,392,187		1,113,749	278,437	1,392,187		1,113,749	278,437	1,392,187		1,212,443	303,111	1,515,554
8	Three 12'x12' box culverts	FT	1500	25%	345	517,500	129,375	646,875	405	607,500	151,875	759,375	465	697,500	174,375	871,875	465	697,500	174,375	871,875	465	697,500	174,375	871,875	465	697,500	174,375	871,875	501	751,500	187,875	939,375
8	RC Concrete cut off walls	CY	250	25%	37	9,250	2,313	11,563	37	9,250	2,313	11,563	37	9,250	2,313	11,563	37	9,250	2,313	11,563	37	9,250	2,313	11,563	37	9,250	2,313	11,563	37	9,250	2,313	11,563
8	RC Concrete Wing wall's slab	CY	200	25%	604	120,800	30,200	151,000	604	120,800	30,200	151,000	604	120,800	30,200	151,000	604	120,800	30,200	151,000	604	120,800	30,200	151,000	604	120,800	30,200	151,000	684	136,800	34,200	171,000
8	RC Concrete Wing wall's wall	CY	250	25%	403	100,750	25,188	125,938	403	100,750	25,188	125,938	403	100,750	25,188	125,938	403	100,750	25,188	125,938	403	100,750	25,188	125,938	403	100,750	25,188	125,938	456	114,000	28,500	142,500
8	Cut off wall reinforcement	LB	0.65	25%	3,651	2,373	593	2,966	3,651	2,373	593	2,966	3,651	2,373	593	2,966	3,651	2,373	593	2,966	3,651	2,373	593	2,966	3,651	2,373	593	2,966	3,651	2,373	593	2,966
8	Slabs reinforcement	LB	0.55	25%	40,520	22,286	5,572	27,858	40,520	22,286	5,572	27,858	40,520	22,286	5,572	27,858	40,520	22,286	5,572	27,858	40,520	22,286	5,572	27,858	40,520	22,286	5,572	27,858	45,230	24,877	6,219	31,096
8	Wing walls reinforcement	LB	0.65	25%	36,465	23,702	5,926	29,628	36,465	23,702	5,926	29,628	36,465	23,702	5,926	29,628	36,465	23,702	5,926	29,628	36,465	23,702	5,926	29,628	36,465	23,702	5,926	29,628	41,027	26,668	6,667	33,334
8	Slab's formwork	SF	8	25%	3,216	25,728	6,432	32,160	3,216	25,728	6,432	32,160	3,216	25,728	6,432	32,160	3,216	25,728	6,432	32,160	3,216	25,728	6,432	32,160	3,216	25,728	6,432	32,160	3,360	26,880	6,720	33,600
8	Walls' formwork	SF	12	25%	9,280	111,360	27,840	139,200	9,280	111,360	27,840	139,200	9,280	111,360	27,840	139,200	9,280	111,360	27,840	139,200	9,280	111,360	27,840	139,200	9,280	111,360	27,840	139,200	10,008	120,096	30,024	150,120
8																																
8	Handrail																															
8	Handrail galvanized 1.5" Diam. Pipes	LB	2	25%	3,520	7,040	1,760	8,800	3,520	7,040	1,760	8,800	3,520	7,040	1,760	8,800	3,520	7,040	1,760	8,800	3,520	7,040	1,760	8,800	3,520	7,040	1,760	8,800	3,652	7,304	1,826	9,130
8	Hwy Guardrail	LF	45	25%	440	19,800	4,950	24,750	440	19,800	4,950	24,750	440	19,800	4,950	24,750	440	19,800	4,950	24,750	440	19,800	4,950	24,750	440	19,800	4,950	24,750	440	19,800	4,950	24,750
8																																
9	Channels and Canals					1,290,778	322,695	1,613,473		1,109,616	277,404	1,387,020		1,086,360	271,590	1,357,950		1,076,931	719,958	1,346,163		1,001,618	701,130	1,252,023		1,052,559	713,865	1,315,698		891,674	222,918	1,114,592
9	Channels																															
9	Excavation, Load, Shape Channel	BCY	0.98	25%	259,740	254,647	63,662	318,309	259,740	254,647	63,662	318,309	259,740	254,647	63,662	318,309	259,740	254,647	514,387	318,309	259,740	254,647	514,387	318,309	259,740	254,647	514,387	318,309	259,740	254,647	63,662	318,309
	Excavation, Haul out of channel and a	BCY	0.98	25%	259,740	254,647	63,662	318,309	259,740	254,647	63,662	318,309	259,740	254,647	63,662	318,309	259,740	254,647	63,662	318,309	259,740	254,647	63,662	318,309	259,740	254,647	63,662	318,309	259,740	254,647	63,662	318,309
	Exc Below Groundwater Line, Dewate	BCY	0.25	25%	62,338	15,584	3,896	19,481	62,338	15,584	3,896	19,481	62,338	15,584	3,896	19,481	62,338	15,584	3,896	19,481	62,338	15,584	3,896	19,481	62,338	15,584	3,896	19,481	62,338	15,584	3,896	19,481
	Usable Exc Below GW Line	**BCY**			**56,104**				**56,104**				**56,104**				**56,104**				**56,104**				**56,104**				**56,104**			
	Exc Above Groundwater Line	BCY			197,402				197,402				197,402				197,402				197,402				197,402				197,402			
	Usable Exc Above GW Line	BCY			177,662				177,662				177,662				177,662				177,662				177,662				177,662			
	Required for Levees	ECY			76,621				125,224				154,151				**155,233**				**175,407**				**161,529**				243,269			
	Required for Levees	BCY			87,069				142,300				175,172				176,401				199,327				183,556				276,442			
	Above GW Exc used for Levees	BCY			87,069				142,300				175,172				176,401				177,662				177,662				177,662			
	Below GW EXC used for Levees, Dr	**BCY**	**1.00**	**25%**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**21,664**	**21,664**	**5,416**	**27,081**	**5,894**	**5,894**	**1,473**	**7,367**	**56,104**	**56,104**	**14,026**	**70,130**
	Above GW Exc to be Disposed	BCY			110,333				55,102				22,231				21,001				19,740				19,740				19,740			
	Below GW EXC to be Disposed	BCY			62,338				62,338				62,338				62,338				40,673				56,444				6,234			
	Exc to be disposed, shaped at Dispos	BCY	1.55	25%	172,671	267,640	66,910	334,549	117,440	182,032	45,508	227,540	84,568	131,081	32,770	163,851	83,339	125,008	31,252	156,260	60,413	90,620	22,655	113,275	76,184	114,276	28,569	142,845	25,974	40,260	10,065	50,325
	Exc to be disposed, haul distance	MI	0.87	2	2				2				2				2				2				2				2			
	Exc to be disposed, haul distance	BCY	1.73	25%	172,671	298,738	74,685	373,423	117,440	203,183	50,796	253,979	84,568	146,312	36,578	182,890	83,339	144,185	36,046	180,231	60,413	104,522	26,130	130,652	76,184	131,806	32,952	164,758	25,974	44,938	11,234	56,172
	Disposal Area Site Prep and Restor	ECY	1.00	25%	2	2	1	3	2	2	1	3	84,568	84,568	21,142	105,711	83,339	83,339	20,835	104,174	60,413	60,413	15,103	75,517	76,184	76,184	19,046	95,230	25,974	25,974	6,494	32,468

ADA FLOOD DAMAGE REDUCTION PROJECT
NED ANALYSIS

ADA FLOOD DAMAGE REDUCTION PROJECT				50 YEAR				100 YEAR			
NED Analysis		Unit Price			5,530,000	1,310,000	6,840,000		5,880,000	1,400,000	7,270,000
Description of Work	Unit	Most Likely	Contingency %	Quantity	Amount	Contingency	Total	Quantity	Amount	Contingency	Total
Total levee fill from JD 51	BCY										
Levee fill required from off site	BCY										
	ecy w/co	1.08131									
9 Topsoil	CY	16	25%	12,470	199,520	49,880	249,400	12,470	199,520	49,880	249,400
9											
11 Levees and Floodwalls					1,529,195	382,299	1,911,494		1,883,707	470,927	2,354,633
11 Levees					685,153	171,288	1,284,629		1,004,232	251,058	1,691,603
11 Fill, Spread and Compact	ECY	2	25%	76,621	153,242	38,311	191,553	125,224	250,448	62,612	313,060
Levee Haul Costs							98,560				138,950
Load off site fill	ECY	0.5	25%	0				0			
Levee fill required from off site	**ECY**			**0**				**0**			
Haul Distance	MI	0.87		3				3			
Cubic Yard Mile	CYM	0.87	25%	0	0	0	0	0	0	0	0
Levee 1 Haull	**ECY**		25%	**12,359**				**22,431**			
Haul Distance	MI	0.87		1				1			
Cubic Yard Mile	CYM	0.87	25%	12,359	10,691	2,673	13,364	22,431	19,404	4,851	24,255
Road Raise at Levee 1 and 2	**ECY**		25%	**978**				**1,245**			
Haul Distance	MI	0.87		1				1			
Cubic Yard Mile	CYM	0.87	25%	978	846	211	1,057	1,245	1,077	269	1,346
Road raise Levee 1	**ECY**		25%					**2,812**			
Haul Distance	MI	0.87		1.33				1.33			
Cubic Yard Mile	CYM	0.87	25%	0	0	0	0	3,728	3,225	806	4,031
Levee 2	**ECY**		25%	**30,322**				**37,674**			
Haul Distance	MI	0.87		2.05				2.05			
Cubic Yard Mile	CYM	0.87	25%	62,022	53,652	13,413	67,065	77,060	66,660	16,665	83,326
Road Raise Over Levee 2	**ECY**		25%	**318**				**448**			
Haul Distance	MI	0.87		1.53				1.53			
Cubic Yard Mile	CYM	0.87	25%	488	422	105	527	688	595	149	744
Levee 3	**ECY**		25%	**2,260**				**3,912**			
Haul Distance	MI	0.87		2.39				2.39			
Cubic Yard Mile	CYM	0.87	25%	5,393	4,665	1,166	5,831	9,336	8,076	2,019	10,095
Road Raise 5 Levee 3	**ECY**		25%	**4,145**				**5,840**			
Haul Distance	MI	0.87		2.39				2.39			
Cubic Yard Mile	CYM	0.87	25%	9,890	8,556	2,139	10,695	13,936	12,055	3,014	15,069
Road Raise 4 Levee 3	**ECY**		25%								
Haul Distance	MI	0.87									
Cubic Yard Mile	CYM	0.87	25%	0	0	0	0	0	0	0	0
Levee 7	**ECY**		25%	**24,458**				**43,880**			
Haul Distance	MI	0.87		0				0			
Cubic Yard Mile	CYM	0.87	25%	0	0	0	0	0	0	0	0
West Option											
Haul Distance	MI	0.87									
Cubic Yard Mile	CYM	0.87	25%								
Road Raise at Intersection	**ECY**		25%	**1,706**				**6,670**			
Haul Distance	MI	0.87		0				0			
Cubic Yard Mile	CYM	0.87	25%	0	0	0	0	0	0	0	0
Levee 8	**ECY**		25%	**76**				**312**			
Haul Distance	MI	0.87	0.25	0.25				0.25			
Cubic Yard Mile	CYM	0.87	25%	19	16	4	21	78	67	17	84
11 Topsoil	CY	4	25%	11,207	44,828	11,207	56,035	14,933	59,732	14,933	74,665

Description of Work	200 YEAR				200 YEAR WITH EAST OPTION			
		6,190,000	1,480,000	7,670,000		6,200,000	1,930,000	7,670,000
	Quantity	Amount	Contingency	Total	Quantity	Amount	Contingency	Total
Total levee fill from JD 51	175,172				176,401			
Levee fill required from off site	0				0			
9 Topsoil	12,470	199,520	49,880	249,400	12,470	199,520	49,880	249,400
9								
11 Levees and Floodwalls		2,048,369	512,092	2,560,461		2,059,097	514,774	2,573,871
11 Levees		1,146,835	286,709	1,869,856		1,157,563	289,391	1,883,266
11 Fill, Spread and Compact	154,151	308,302	77,076	385,378	**155,233**	310,466	77,617	388,083
Levee Haul Costs				175,002	155,233			175,293
Load off site fill	0				0			
Levee fill required from off site	**0**				**0**			
Haul Distance	3				3			
Cubic Yard Mile	0	0	0	0	0	0	0	0
Levee 1 Haull	**32,716**				**32,716**			
Haul Distance	1				1			
Cubic Yard Mile	32,716	28,301	7,075	35,376	32,716	28,301	7,075	35,376
Road Raise at Levee 1 and 2	**1,705**				**1,705**			
Haul Distance	1				1			
Cubic Yard Mile	1,705	1,475	369	1,843	1,705	1,475	369	1,843
Road raise Levee 1	**4,488**				**4,488**			
Haul Distance	1.33				1.33			
Cubic Yard Mile	5,950	5,147	1,287	6,434	5,950	5,147	1,287	6,434
Levee 2	**43,855**				**43,855**			
Haul Distance	2.05				2.05			
Cubic Yard Mile	89,704	77,598	19,400	96,998	89,704	77,598	19,400	96,998
Road Raise Over Levee 2	**543**				**543**			
Haul Distance	1.53				1.53			
Cubic Yard Mile	833	721	180	901	833	721	180	901
Levee 3	**5,800**				**5,800**			
Haul Distance	2.39				2.39			
Cubic Yard Mile	13,842	11,974	2,993	14,967	13,842	11,974	2,993	14,967
Road Raise 5 Levee 3	**7,128**				**7,128**			
Haul Distance	2.39				2.39			
Cubic Yard Mile	17,010	14,715	3,679	18,394	17,010	14,715	3,679	18,394
Road Raise 4 Levee 3								
Haul Distance								
Cubic Yard Mile	0	0	0	0	0	0	0	0
Levee 7	**46,779**				**46,779**			
Haul Distance	0.54				0			
Cubic Yard Mile	1	1	0	1	0	0	0	0
West Option								
Haul Distance								
Cubic Yard Mile								
Road Raise at Intersection	**10,811**				**10,811**			
Haul Distance	0				0			
Cubic Yard Mile	0	0	0	0	0	0	0	0
Levee 8	**325**				**1,407**			
Haul Distance	0.25				0.25			
Cubic Yard Mile	81	70	18	88	352	304	76	380
11 Topsoil	16,850	67,400	16,850	84,250	17,186	68,745	17,186	85,932

Description of Work	200 YEAR WITH WEST OPTION				200 YEAR WITH NORTHWEST OPTION				500 YEAR			
		6,180,000	1,920,000	7,660,000		6,180,000	1,920,000	7,650,000		7,200,000	1,700,000	8,910,000
	Quantity	Amount	Contingency	Total	Quantity	Amount	Contingency	Total	Quantity	Amount	Contingency	Total
Total levee fill from JD 51	199,327				183,556				233,766			
Levee fill required from off site	0				0				42,676			
9 Topsoil	12,470	199,520	49,880	249,400	12,470	199,520	49,880	249,400	12,470	199,520	49,880	249,400
9												
11 Levees and Floodwalls		2,118,625	529,656	2,648,282		2,072,687	518,172	2,590,859		2,744,119	686,030	3,430,148
11 Levees		1,217,091	304,273	1,957,677		1,171,153	292,788	1,900,254		1,803,353	450,838	2,690,504
11 Fill, Spread and Compact	**175,407**	350,815	87,704	438,518	**161,529**	323,059	80,765	403,823	243,269	486,538	121,635	608,173
Levee Haul Costs	175,407			197,850	161,529			182,980	277,103			476,555
Load off site fill	0				0				37,555	18,777	4,694	23,472
Levee fill required from off site	**0**				**0**				**37,555**			
Haul Distance	3				3				3			
Cubic Yard Mile	0	0	0	0	0	0	0	0	112,665	97,461	24,365	121,826
Levee 1 Haull	**31,396**				**40,095**				**45,032**			
Haul Distance	1				1				1			
Cubic Yard Mile	31,396	27,159	6,790	33,949	40,095	34,684	8,671	43,355	45,032	38,955	9,739	48,694
Road Raise at Levee 1 and 2	**1,705**				**1,705**				**3,522**			
Haul Distance	1				1				1			
Cubic Yard Mile	1,705	1,475	369	1,843	1,705	1,475	369	1,843	3,522	3,047	762	3,809
Road raise Levee 1	**11,753**				**4,488**				**7,479**			
Haul Distance	1.33				1.33				1.33			
Cubic Yard Mile	15,582	13,479	3,370	16,849	5,950	5,147	1,287	6,434	9,916	8,578	2,144	10,722
Levee 2	**41,471**				**43,855**				**56,188**			
Haul Distance	2.05				2.05				2.05			
Cubic Yard Mile	84,826	73,379	18,345	91,724	89,704	77,598	19,400	96,998	114,930	99,420	24,855	124,275
Road Raise Over Levee 2	**543**				**543**				**5,436**			
Haul Distance	1.53				1.53				1.53			
Cubic Yard Mile	833	721	180	901	833	721	180	901	8,339	7,214	1,804	9,018
Levee 3	**5,800**				**5,800**				**39,551**			
Haul Distance	2.39				2.39				2.39			
Cubic Yard Mile	13,842	11,974	2,993	14,967	13,842	11,974	2,993	14,967	94,384	81,647	20,412	102,059
Road Raise 5 Levee 3	**7,128**				**7,128**				**8,847**			
Haul Distance	2.39				2.39				2.39			
Cubic Yard Mile	17,010	14,715	3,679	18,394	17,010	14,715	3,679	18,394	21,112	18,263	4,566	22,829
Road Raise 4 Levee 3									**3,721**			
Haul Distance									2			
Cubic Yard Mile	0	0	0	0	0	0	0	0	8,893	7,693	1,923	9,617
Levee 7	**46,779**				**46,779**				**59,593**			
Haul Distance	0				0				0			
Cubic Yard Mile	0	0	0	0	0	0	0	0	0	0	0	0
West Option	**17,696**											
Haul Distance	1											
Cubic Yard Mile	17,696	15,308	3,827	19,135								
Road Raise at Intersection	**10,811**				**10,811**				**13,029**			
Haul Distance	0.00				0				0			
Cubic Yard Mile	0	0	0	0	0	0	0	0	0	0	0	0
Levee 8	325				**325**				**869**			
Haul Distance	0.25				0.25				0.25			
Cubic Yard Mile	81	70	18	88	81	70	18	88	217	188	47	235
11 Topsoil	18,075	72,299	18,075	90,374	17,309	69,236	17,309	86,545	24,334	97,336	24,334	121,670

	ADA FLOOD DAMAGE REDUCTION PROJECT				50 YEAR				100 YEAR				200 YEAR				200 YEAR WITH EAST OPTION				200 YEAR WITH WEST OPTION				200 YEAR WITH NORTHWEST OPTION				500 YEAR			
	NED Analysis		Unit Price			5,530,000	1,310,000	6,840,000		5,880,000	1,400,000	7,270,000		6,190,000	1,480,000	7,670,000		6,200,000	1,930,000	7,670,000		6,180,000	1,920,000	7,660,000		6,180,000	1,920,000	7,650,000		7,200,000	1,700,000	8,910,000
	Description of Work	Unit	Most Likely	Contingency %	Quantity	Amount	Contingency	Total	Quantity	Amount	Contingency	Total	Quantity	Amount	Contingency	Total	Quantity	Amount	Contingency	Total	Quantity	Amount	Contingency	Total	Quantity	Amount	Contingency	Total	Quantity	Amount	Contingency	Total
11	Stripping	CY	3	25%	16,467	49,401	12,350	61,751	20,917	62,751	15,688	78,439	24,708	74,124	18,531	92,655	25,213	75,640	18,910	94,550	25,402	76,207	19,052	95,258	25,361	76,083	19,021	95,103	35,263	105,789	26,447	132,236
11	Inspection Trench	LF	4	25%	22,424	89,696	22,424	112,120	22,848	91,392	22,848	114,240	24,403	97,612	24,403	122,015	25,763	103,054	25,763	128,817	25,017	100,068	25,017	125,084	24,249	96,998	24,249	121,247	29,111	116,444	29,111	145,555
11	Pavement Removal	SF	1	25%	83,513	83,513	20,878	104,391	133,069	133,069	33,267	166,336	142,580	142,580	35,645	178,225	142,580	142,580	35,645	178,224	142,580	142,580	35,645	178,224	142,580	142,580	35,645	178,225	191,187	191,187	47,797	238,984
11	2" Wear Course	CY	90	25%	516	46,440	11,610	58,050	821	73,890	18,473	92,363	880	79,200	19,800	99,000	880	79,211	19,803	99,014	880	79,211	19,803	99,014	880	79,200	19,800	99,000	1,180	106,200	26,550	132,750
11	4" Base Course	CY	90	25%	1,031	92,790	23,198	115,988	1,643	147,870	36,968	184,838	1,760	158,400	39,600	198,000	1,760	158,422	39,605	198,027	1,760	158,422	39,605	198,027	1,760	158,400	39,600	198,000	2,360	212,400	53,100	265,500
11	12" Aggegate Base	CY	15	25%	3,093	46,395	11,599	57,994	4,928	73,920	18,480	92,400	5,281	79,215	19,804	99,019	5,281	79,211	19,803	99,014	5,281	79,211	19,803	99,014	5,281	79,215	19,804	99,019	7,081	106,215	26,554	132,769
11	**12" RCP**	LF	55	25%	5550	305,250	76,313	381,563	5550	305,250	76,313	381,563	5550	305,250	76,313	381,563	5550	305,250	76,313	381,563	5,550	305,250	76,313	381,563	5550	305,250	76,313	381,563	5550	305,250	76,313	381,563
11	**Catch Basins**	EA	4000	25%	7	28,000	7,000	35,000	7	28,000	7,000	35,000	7	28,000	7,000	35,000	7	28,000	7,000	35,000	7	28,000	7,000	35,000	7	28,000	7,000	35,000	7	28,000	7,000	35,000
11	12" RCP, Driveway Culverts	LF	50	25%	186	9,300	2,325	11,625	316	15,800	3,950	19,750	316	15,800	3,950	19,750	316	15,800	3,950	19,750	316	15,800	3,950	19,750	316	15,800	3,950	19,750	316	15,800	3,950	19,750
11																																
11	Gatewells							626,865				663,031				690,605				690,605				690,605				690,605				739,644
11	Additional 3 Gatewells and outlets	LS	0.28571	25%	390,049	111,443	27,861	139,303	412,552	117,872	29,468	147,340	429,710	122,774	30,694	153,468	429,710	122,774	30,694	153,468	429,710	122,774	30,694	153,468	429,710	122,774	30,694	153,468	460,223	131,492	32,873	164,365
11	Site Preparation							34,215				42,044				42,854				42,854				42,854				42,854				51,271
11	New Ground Surface	Elev			6,312				6,319				6,326				6,326				6,326				6,326				6,335			
11	Existing Ground Surface Elevation	Elev			6,305				6,308				6,312				6,312				6,312				6,312				6,312			
11	Bottom of Excavation Elevation	Elev			6,240				6,240				6,232				6,232				6,232				6,232				6,232			
11	Excavation	CY	6	25%	1,790	10,740	2,685	13,425	2,331	13,986	3,497	17,483	2,166	12,996	3,249	16,245	2,166	12,996	3,249	16,245	2,166	12,996	3,249	16,245	2,166	12,996	3,249	16,245	2,166	12,996	3,249	16,245
11	Excavation Length at Bottom	FT			82				82				82				82				82				82				82			
11	Excavation Width at Bottom	FT			75				75				75				75				75				75				75			
11	Side Slopes 1 Vertical to X Horizonta	Slope																														
11	Backfill	CY	7	25%	2,376	16,632	4,158	20,790	2,807	19,649	4,912	24,561	3,041	21,287	5,322	26,609	3,041	21,287	5,322	26,609	3,041	21,287	5,322	26,609	3,041	21,287	5,322	26,609	4,003	28,021	7,005	35,026
11																																
11	Base Slab Concrete							11,606				11,606				12,171				12,171				12,171				12,171				12,171
11	Forms	SF	8	25%	300	2,400	600	3,000	300	2,400	600	3,000	319	2,552	638	3,190	319	2,552	638	3,190	319	2,552	638	3,190	319	2,552	638	3,190	319	2,552	638	3,190
11	Reinforcing	LB	0.55	25%	3,630	1,997	499	2,496	3,630	1,997	499	2,496	3,630	1,997	499	2,496	3,630	1,997	499	2,496	3,630	1,997	499	2,496	3,630	1,997	499	2,496	3,630	1,997	499	2,496
11	Concrete	CY	150	25%	26	3,900	975	4,875	26	3,900	975	4,875	28	4,200	1,050	5,250	28	4,200	1,050	5,250	28	4,200	1,050	5,250	28	4,200	1,050	5,250	28	4,200	1,050	5,250
11	Finished Surface (Float Finish)	SF	1	25%	604	604	151	755	604	604	151	755	604	604	151	755	604	604	151	755	604	604	151	755	604	604	151	755	604	604	151	755
11	Construction Joint Surface Treatment	SF	2	25%	192	384	96	480	192	384	96	480	192	384	96	480	192	384	96	480	192	384	96	480	192	384	96	480	192	384	96	480
11																																
11	Wall Concrete							98,248				107,659				114,872				114,872				114,872				114,872				126,468
11	Forms	SF	12	25%	4,198	50,376	12,594	62,970	4,620	55,440	13,860	69,300	4,850	58,200	14,550	72,750	4,850	58,200	14,550	72,750	4,850	58,200	14,550	72,750	4,850	58,200	14,550	72,750	5,326	63,912	15,978	79,890
11	Reinforcing	LB	0.55	25%	15,546	8,550	2,138	10,688	17,228	9,475	2,369	11,844	17,901	9,846	2,461	12,307	17,901	9,846	2,461	12,307	17,901	9,846	2,461	12,307	17,901	9,846	2,461	12,307	19,983	10,991	2,748	13,738
11	Concrete	CY	220	25%	88	19,360	4,840	24,200	95	20,900	5,225	26,125	107	23,540	5,885	29,425	107	23,540	5,885	29,425	107	23,540	5,885	29,425	107	23,540	5,885	29,425	118	25,960	6,490	32,450
11	Construction Joint Surface Treatment	SF	2	25%	156	312	78	390	156	312	78	390	156	312	78	390	156	312	78	390	156	312	78	390	156	312	78	390	156	312	78	390
11																																
11	Elevated Slab Concrete							6,475				6,475				6,475				6,475				6,475				6,475				6,475
11	Forms	SF	12	25%	185	2,220	555	2,775	185	2,220	555	2,775	185	2,220	555	2,775	185	2,220	555	2,775	185	2,220	555	2,775	185	2,220	555	2,775	185	2,220	555	2,775
11	Reinforcing	LB	0.55	25%	2,372	1,305	326	1,631	2,372	1,305	326	1,631	2,372	1,305	326	1,631	2,372	1,305	326	1,631	2,372	1,305	326	1,631	2,372	1,305	326	1,631	2,372	1,305	326	1,631
11	Concrete	CY	250	25%	6	1,500	375	1,875	6	1,500	375	1,875	6	1,500	375	1,875	6	1,500	375	1,875	6	1,500	375	1,875	6	1,500	375	1,875	6	1,500	375	1,875
11	Finish Top Surface, Steel Trowel	SF	1	25%	155	155	39	194	155	155	39	194	155	155	39	194	155	155	39	194	155	155	39	194	155	155	39	194	155	155	39	194
11																																
11	RCP Pipes							81,250				87,050				97,950				97,950				97,950				97,950				105,375
11	48" Diam RCP Pipe, class 4	LF	240	25%	88	21,120	5,280	26,400	104	24,960	6,240	31,200	112	26,880	6,720	33,600	112	26,880	6,720	33,600	112	26,880	6,720	33,600	112	26,880	6,720	33,600	118	28,320	7,080	35,400
11	48" Diam RCP Pipe End Section, clas	EA	1,440	25%	2	2,880	720	3,600	2	2,880	720	3,600	2	2,880	720	3,600	2	2,880	720	3,600	2	2,880	720	3,600	2	2,880	720	3,600	2	2,880	720	3,600
11	36" Diam RCP Pipe, Use existing	LF	200	25%	88	17,600	4,400	22,000	88	17,600	4,400	22,000	112	22,400	5,600	28,000	112	22,400	5,600	28,000	112	22,400	5,600	28,000	112	22,400	5,600	28,000	123	24,600	6,150	30,750
11	36" Diam RCP Pipe End Section, clas	EA	1,200	25%	8	9,600	2,400	12,000	8	9,600	2,400	12,000	8	9,600	2,400	12,000	8	9,600	2,400	12,000	8	9,600	2,400	12,000	8	9,600	2,400	12,000	8	9,600	2,400	12,000
11	30" Diam RCP Pipe, Class 3	LF	150	25%	56	8,400	2,100	10,500	56	8,400	2,100	10,500	64	9,600	2,400	12,000	64	9,600	2,400	12,000	64	9,600	2,400	12,000	64	9,600	2,400	12,000	76	11,400	2,850	14,250
11	30" Diam RCP Pipe End Section, clas	EA	900	25%	2	1,800	450	2,250	2	1,800	450	2,250	2	1,800	450	2,250	2	1,800	450	2,250	2	1,800	450	2,250	2	1,800	450	2,250	2	1,800	450	2,250
11	24" Diam RCP Pipe, Class 3	LF	100	25%	24	2,400	600	3,000	32	3,200	800	4,000	40	4,000	1,000	5,000	40	4,000	1,000	5,000	40	4,000	1,000	5,000	40	4,000	1,000	5,000	45	4,500	1,125	5,625
11	24" Diam RCP Pipe End Section, clas	EA	600	25%	2	1,200	300	1,500	2	1,200	300	1,500	2	1,200	300	1,500	2	1,200	300	1,500	2	1,200	300	1,500	2	1,200	300	1,500	2	1,200	300	1,500
11																																
11																																

ADA FLOOD DAMAGE REDUCTION PROJECT
NED ANALYSIS

	ADA FLOOD DAMAGE REDUCTION PROJECT				50 YEAR				100 YEAR			
	NED Analysis		Unit Price			5,530,000	1,310,000	6,840,000		5,880,000	1,400,000	7,270,000
	Description of Work	Unit	Most Likely	Contingency %	Quantity	Amount	Contingency	Total	Quantity	Amount	Contingency	Total
11	Gratings							3,020				3,020
11	Grating, serrated	SF	4.00	25%	159	636	159	795	159	636	159	795
11	Framing Angle, Steel, Galvanized	LB	1.00	25%	1,292	1,292	323	1,615	1,292	1,292	323	1,615
11	Headed Studs, Welded to Framing An	EA	4.00	25%	122	488	122	610	122	488	122	610
11												
11	Ladder, Wall Mounted or Vertical Grab Bars							5,610				5,723
11	Galvanized Steel Ladder bolted to Co	LF	45.00	25%	80	3,600	900	4,500	82	3,690	923	4,613
11	1/2" Anchor Bolts, x 5"	EA	12.00	25%	74	888	222	1,110	74	888	222	1,110
11												
11	Sluice Gate					109,215	27,304	136,519		109,215	27,304	136,519
11	48" Diam. Sluice Gate	EA	23,940	25%	1	23,940	5,985	29,925	1	23,940	5,985	29,925
11	36" Diam. Sluice Gate	EA	15,517	25%	4	62,067	15,517	77,583	4	62,067	15,517	77,583
11	30" Diam. Sluice Gate	EA	12,569	25%	1	12,569	3,142	15,711	1	12,569	3,142	15,711
11	24" Diam. Sluice Gate	EA	10,640	25%	1	10,640	2,660	13,300	1	10,640	2,660	13,300
11												
11	Stoplog Panel and grooves							61,138				66,115
11	4x6x1/4-4.5ft long aluminum tube stop	EA	306.25	25%	146	44,713	11,178	55,891	159	48,694	12,173	60,867
11	Sill Chanel and frame, Galvanized ste	LB	2	25%	1,091	2,182	546	2,728	1,091	2,182	546	2,728
11	Anchors, 16" long	EA	12	25%	42	504	126	630	42	504	126	630
11	1/2" Anchor Bolts, x 5"	EA	12	25%	126	1,512	378	1,890	126	1,512	378	1,890
11												
11	Fence							5,900				5,900
11	6' high fence	LF	15	25%	198	2,970	743	3,713	198	2,970	743	3,713
11	Personnel gate, 3.5' wide	EA	250	25%	7	1,750	438	2,188	7	1,750	438	2,188
11												
11	Remove							43,581				43,581
11	18" CMP	LF	15	25%	73	1,095	274	1,369	73	1,095	274	1,369
11	12" CMP	LF	13	25%	290	3,770	943	4,713	290	3,770	943	4,713
11	48" Wide Control Structure	EA	5000	25%	6	30,000	7,500	37,500	6	30,000	7,500	37,500
11												
11												
30	Planning Engineering and Design	LS	12%	25%	4,045,684	485,482	121,371	606,853	4,337,113	520,454	130,113	650,567
31												
31	Construction Management	LS	7%	25%	4,045,684	283,198	70,799	353,997	4,337,113	303,598	75,899	379,497
31												
31						5,525,825	1,310,310	6,836,135		5,876,270	1,397,557	7,273,827
	Average Annual Operation and Maintenance			0.5%	4,045,684	20,228	5,057	25,286	4,337,113	21,686	5,421	27,107

		200 YEAR				200 YEAR WITH EAST OPTION			
			6,190,000	1,480,000	7,670,000		6,200,000	1,930,000	7,670,000
	Description of Work	Quantity	Amount	Contingency	Total	Quantity	Amount	Contingency	Total
11	Gratings				3,020				3,020
11	Grating, serrated	159	636	159	795	159	636	159	795
11	Framing Angle, Steel, Galvanized	1,292	1,292	323	1,615	1,292	1,292	323	1,615
11	Headed Studs, Welded to Framing An	122	488	122	610	122	488	122	610
11									
11	Ladder, Wall Mounted or Vertical Grab Bars				5,723				5,723
11	Galvanized Steel Ladder bolted to Co	82	3,690	923	4,613	82	3,690	923	4,613
11	1/2" Anchor Bolts, x 5"	74	888	222	1,110	74	888	222	1,110
11									
11	Sluice Gate		109,215	27,304	136,519		109,215	27,304	136,519
11	48" Diam. Sluice Gate	1	23,940	5,985	29,925	1	23,940	5,985	29,925
11	36" Diam. Sluice Gate	4	62,067	15,517	77,583	4	62,067	15,517	77,583
11	30" Diam. Sluice Gate	1	12,569	3,142	15,711	1	12,569	3,142	15,711
11	24" Diam. Sluice Gate	1	10,640	2,660	13,300	1	10,640	2,660	13,300
11									
11	Stoplog Panel and grooves				68,074				68,074
11	4x6x1/4-4.5ft long aluminum tube stop	164	50,225	12,556	62,781	164	50,225	12,556	62,781
11	Sill Chanel and frame, Galvanized ste	1,109	2,218	555	2,773	1,109	2,218	555	2,773
11	Anchors, 16" long	42	504	126	630	42	504	126	630
11	1/2" Anchor Bolts, x 5"	126	1,512	378	1,890	126	1,512	378	1,890
11									
11	Fence				5,900				5,900
11	6' high fence	198	2,970	743	3,713	198	2,970	743	3,713
11	Personnel gate, 3.5' wide	7	1,750	438	2,188	7	1,750	438	2,188
11									
11	Remove				43,581				43,581
11	18" CMP	73	1,095	274	1,369	73	1,095	274	1,369
11	12" CMP	290	3,770	943	4,713	290	3,770	943	4,713
11	48" Wide Control Structure	6	30,000	7,500	37,500	6	30,000	7,500	37,500
11									
11									
30	Planning Engineering and Design	4,598,534	551,824	137,956	689,780	4,599,839	551,981	137,995	689,976
31									
31	Construction Management	4,598,534	321,897	80,474	402,372	4,599,839	321,989	80,497	402,486
31									
31			6,190,465	1,475,795	7,666,261		6,197,236	1,927,692	7,674,203
	Average Annual Operation and Maintenance	4,598,534	22,993	5,748	28,741	4,599,839	22,999	5,750	28,749

		200 YEAR WITH WEST OPTION				200 YEAR WITH NORTHWEST OPTION			
			6,180,000	1,920,000	7,660,000		6,180,000	1,920,000	7,650,000
	Description of Work	Quantity	Amount	Contingency	Total	Quantity	Amount	Contingency	Total
11	Gratings				3,020				3,020
11	Grating, serrated	159	636	159	795	159	636	159	795
11	Framing Angle, Steel, Galvanized	1,292	1,292	323	1,615	1,292	1,292	323	1,615
11	Headed Studs, Welded to Framing An	122	488	122	610	122	488	122	610
11									
11	Ladder, Wall Mounted or Vertical Grab Bars				5,723				5,723
11	Galvanized Steel Ladder bolted to Co	82	3,690	923	4,613	82	3,690	923	4,613
11	1/2" Anchor Bolts, x 5"	74	888	222	1,110	74	888	222	1,110
11									
11	Sluice Gate		109,215	27,304	136,519		109,215	27,304	136,519
11	48" Diam. Sluice Gate	1	23,940	5,985	29,925	1	23,940	5,985	29,925
11	36" Diam. Sluice Gate	4	62,067	15,517	77,583	4	62,067	15,517	77,583
11	30" Diam. Sluice Gate	1	12,569	3,142	15,711	1	12,569	3,142	15,711
11	24" Diam. Sluice Gate	1	10,640	2,660	13,300	1	10,640	2,660	13,300
11									
11	Stoplog Panel and grooves				68,074				68,074
11	4x6x1/4-4.5ft long aluminum tube stop	164	50,225	12,556	62,781	164	50,225	12,556	62,781
11	Sill Chanel and frame, Galvanized ste	1,109	2,218	555	2,773	1,109	2,218	555	2,773
11	Anchors, 16" long	42	504	126	630	42	504	126	630
11	1/2" Anchor Bolts, x 5"	126	1,512	378	1,890	126	1,512	378	1,890
11									
11	Fence				5,900				5,900
11	6' high fence	198	2,970	743	3,713	198	2,970	743	3,713
11	Personnel gate, 3.5' wide	7	1,750	438	2,188	7	1,750	438	2,188
11									
11	Remove				43,581				43,581
11	18" CMP	73	1,095	274	1,369	73	1,095	274	1,369
11	12" CMP	290	3,770	943	4,713	290	3,770	943	4,713
11	48" Wide Control Structure	6	30,000	7,500	37,500	6	30,000	7,500	37,500
11									
11									
30	Planning Engineering and Design	4,583,976	550,077	137,519	687,596	4,589,004	550,680	137,670	688,351
31									
31	Construction Management	4,583,976	320,878	80,220	401,098	4,589,004	321,230	80,308	401,538
31									
31			6,184,881	1,923,951	7,658,106		6,179,125	1,923,685	7,652,085
	Average Annual Operation and Maintenance	4,583,976	22,920	5,730	28,650	4,589,004	22,945	5,736	28,681

		500 YEAR			
			7,200,000	1,700,000	8,910,000
	Description of Work	Quantity	Amount	Contingency	Total
11	Gratings				3,020
11	Grating, serrated	159	636	159	795
11	Framing Angle, Steel, Galvanized	1,292	1,292	323	1,615
11	Headed Studs, Welded to Framing An	122	488	122	610
11					
11	Ladder, Wall Mounted or Vertical Grab Bars				6,450
11	Galvanized Steel Ladder bolted to Co	92	4,140	1,035	5,175
11	1/2" Anchor Bolts, x 5"	85	1,020	255	1,275
11					
11	Sluice Gate		109,215	27,304	136,519
11	48" Diam. Sluice Gate	1	23,940	5,985	29,925
11	36" Diam. Sluice Gate	4	62,067	15,517	77,583
11	30" Diam. Sluice Gate	1	12,569	3,142	15,711
11	24" Diam. Sluice Gate	1	10,640	2,660	13,300
11					
11	Stoplog Panel and grooves				78,049
11	4x6x1/4-4.5ft long aluminum tube stop	189	57,881	14,470	72,352
11	Sill Chanel and frame, Galvanized ste	1,223	2,446	612	3,058
11	Anchors, 16" long	42	504	126	630
11	1/2" Anchor Bolts, x 5"	134	1,608	402	2,010
11					
11	Fence				5,900
11	6' high fence	198	2,970	743	3,713
11	Personnel gate, 3.5' wide	7	1,750	438	2,188
11					
11	Remove				43,581
11	18" CMP	73	1,095	274	1,369
11	12" CMP	290	3,770	943	4,713
11	48" Wide Control Structure	6	30,000	7,500	37,500
11					
11					
30	Planning Engineering and Design	5,208,259	624,991	156,248	781,239
31					
31	Construction Management	5,208,259	364,578	91,145	455,723
31					
31			7,204,789	1,700,501	8,905,290
	Average Annual Operation and Maintenance	5,208,259	26,041	6,510	32,552

SECTION 205 FEASIBILITY REPORT

ADA, MINNESOTA

WILD RICE AND MARSH RIVERS, MINNESOTA

APPENDIX J

IMPLEMENTATION COST ESTIMATE

SECTION 205 FEASIBILITY REPORT
ADA, MINNESOTA
IMPLEMENTATION COST ESTIMATE

(the implementation cost estimate will be included in the Final Feasibility Report)

SECTION 205 FEASIBILITY REPORT

ADA, MINNESOTA

WILD RICE AND MARSH RIVERS, MINNESOTA

APPENDIX K

PROJECT MANAGEMENT PLAN

PROJECT MANAGEMENT PLAN
Ada, Mn. – Section 205 Flood Risk Management Project

8 December 2008

1. NAME OF PRODUCT: Ada, Minnesota, Section 205 Flood Risk Management Project.

2. PURPOSE: To study the feasibility of, and to design and construct a flood risk management project for the city of Ada, Minnesota, under the authority of Section 205 of the 1948 Flood Control Act, in accordance with Corps' guidelines.

3. STUDY SCOPE AND PHASING: This project study plan covers the feasibility, design and implementation and project turnover phases of the Ada Section 205 flood risk management project.

4. PHYSICAL LOCATION: The City of Ada is located approximately 220 miles northwest of St. Paul, Minnesota, in northwestern Minnesota. Ada is bounded by the south by the old Marsh River, and on the north by Judicial Ditch 51. The Marsh River is a tributary of the Red River of the North. Flooding in Ada occurs from high stages on the Marsh River and on Judicial Ditch 51, sometimes caused by overflows from the Wild Rice River, located two miles to the south.

5. DESCRIPTION OF EXISTING FLOOD CONTROL FEATURES: The City of Ada has existing levees the south, east and part of the north sides of the city. The level of protection offered by the levees varies from an effective elevation of 900.0 at the southwest levee, to elevation 905.0 on the east side. The existing levees adjacent to JD 51 are threatened by degradation of the side slopes of the ditch, and have an effective elevation of 903.0. Substantial work was done on the existing levees following the 1997 flood, and the interior drainage outlets following the 2002 flood. The upgraded outlets have partitioned concrete gatewells with sluice gates that allow for shutting the outlets during flood events, and pumping interior flows over the levees. The City of Ada has submersible pumps for each of these outlets. The pumps are gas-powered, and can be used during a power outage.

6. HISTORY/PRIOR STUDIES: The City of Ada incurred approximately $40,000,000 in direct damage as a result of the April 1997 flood. The residential area of the town received extensive damage. Following the 1997 flood, the City of Ada constructed dikes on the south side of the city, and relocated the hospital and high school to higher ground on the west side of the city.

   On December 10, 1997, the Wild Rice Watershed District, acting as the sponsor for the City of Ada, passed a resolution requesting the Corps of Engineers to conduct studies to determine the feasibility of developing a small flood control project to provide long term flood protection for the community of Ada, under the authority of Section 205 of the Flood Control Act of 1948.

The Corps conducted a Federal interest study, which indicated that Ada was a good candidate for a full feasibility study. This study is documented in the report entitled "Initial Assessment for Flood Damage Reduction - Wild Rice and Marsh Rivers, and Judicial Ditch 51" dated July 1999.

The original Feasibility Cost Share Agreement was signed between the Wild Rice Watershed District, acting on behalf of the City of Ada, and the Corps on 7 April 2000.

The study team, including the local sponsor and interested agencies, conducted an alternatives workshop, where problem areas were identified, and alternatives to address the issues were identified. The Corps then conducted a detailed inventory of flood-prone structures, and formulated alternative plans. The alternatives analysis resulted in a recommendation to construct a levee around the City of Ada, and re-routing a portion of Judicial Ditch 51. Base information was gathered, hydrologic, hydraulic and economic analyses were completed. Cost estimates were prepared for the recommended plan, at three levels of protection. The resulting economic analysis, concluded that benefit-cost ratios were below 1.0 for all alternatives, and that a project was not feasible.

A draft feasibility report was submitted in February 2001 with the conclusion that there were not sufficient benefits to support the cost of the proposed plan. In April 2001, local interests agreed verbally with the Corps' conclusions. A draft Feasibility report was completed on 14 August 2001, documenting the findings, and recommending terminating the study. The final feasibility report was completed in February 2002, indicating local concurrence on terminating the study.

Prior to termination of the study, the Wild Rice River basin received two record-setting rainfall events in June of 2002. The City of Ada successfully fought the floods of June 2002. During the flood-fight activities, Corps observers noted leakage around several culverts in the dike system, which called into question the credit previously given the existing levees. Following these flood events, the hydraulic discharge-frequency curves for the Wild Rice River were recomputed, including the effects of the 2002 floods. The benefit-cost analysis was reanalyzed, using these revised discharge-frequency relationships, and giving less credit to the existing levees. The reanalysis resulted in a benefit-cost ratio of over 2.0, indicating that a small flood control project at Ada was now feasible. The Corps informed the City of Ada of this change in outlook in November 2002.

In December 2002, the City of Ada expressed interest in continuing the study. In May 2003, the Corps forwarded a letter outlining the steps required to continue the study, and an estimate of costs. On January 6, 2004, the City of Ada passed resolution 2004-01-01, authorizing reactivation of the study. This resolution was forwarded to the Corps on March 28, 2004.

A feasibility cost share agreement was signed with the City of Ada on October 3, 2005, and a new feasibility study was begun.

7. SCOPE OF WORK: The objective is to determine if it is feasible to provide additional, more complete, or more reliable flood risk management to the City of Ada. And, if a project is feasible, to continue with detailed design, construction, and project turnover to the City of Ada.

8. ACCOUNTING AND SCHEDULE INFORMATION:

Accounting Data: CEFMS CWIS NO: 150109
P2 Project Number: 110835

Milestones:

Sign new FCSA (CW 130)	3 Oct 2005
Receive local funds	9 Jan 2006
Receive Federal funds	6 Feb 2006
Restart Study (CW140)	21 Feb 2006
In-progress review	Feb 2007
Value Engineering study (CW 290)	Nov 2007
Alternatives Formulation Briefing (CW 190)	Jan 2008
Feasibility Project Guidance Memo (CW 060)	Feb2008
Draft Feasibility Report (DPR) (CW 150)	Jul 2008
CAP EA or FONSI Complete (CW 200)	Mar 2009
Submit final report to MVD (CW160)	Jun 2009
Feasibility report approved (CW170)	Aug 2009
MVD issues CAP Feas Commander's notice (CW260)	Aug 2009

The following are future milestones. The actual dates will be subject to the availability of Federal funding:

Sign Project Cooperation Agreement	Oct 2009
Initiate Plans and Specifications (CW300)	Oct 2009
Begin Real Estate Acquisition	Nov 2009
Complete Plans and Specifications (CW310)	Nov 2010
Complete Real Estate Acquisition	Nov 2010
Certify Real Estate/BCOE Certif (CW360)	Dec 2010
Advertise for construction	Jan 2011
Open Bids	Mar 2011
Award Construction Contract (CC800)	May 2011
Initiate Construction	June 2011
Interim O&M Manuals of completed features	As completed
Interim turnover of completed features	As completed
Complete physical Construction (contract) (CW450)	Sep 2012
Final O&M manuals	Sep 2012
Closeout construction contract (CC840)	Oct 2012
Fiscal Completion (CW470)	Mar 2013
Final turnover	May 2013

9. TECHNICAL CRITERIA:

Current Corps of Engineers ER's, EC's, EM's, and Policy Guidance Letters will be used to establish plan formulation, design, environmental assessment, implementation and operational criteria for this project. The plan formulation and development shall be in accordance with the National Environmental Policy Act (NEPA).

10. REFERENCES:

a. EC 1105-2-217, "Planning – The Continuing Authorities Program Interim Guidance," dated 30 November 1999.
b. 1994 Flood Insurance Maps.
c. CECW-PE Planning Guidance Letter 96-3, dated 16 August 1996.
d. ER 1105-2-100, "Guidance for Conducting Civil Works Planning Studies."
e. Survey and Engineering Data: None available.
f. Determination of Federal Interest Report – Ada, Minnesota.
g. Hydraulic model studies. HEC-RAS files.
h. Economic analysis files.
i. As-built information from Moore Engineering.
j. 16 August 2006 "Credit to Existing Levees" report.
k. Lidar data – DNR 2006.

11. STUDY TEAM: The feasibility, design and implementation phases will be performed by the St. Paul District Corps of Engineers, with participation by the City of Ada as the project local sponsor.

12. INDEPENDENT TECHNICAL REVIEW (ITR): An independent technical review shall be performed within the St. Paul District, by a team not involved with the study. The expertise and technical backgrounds of the ITR team members shall qualify them to provide a comprehensive technical review of the product. The review shall be ongoing through product development. All comments resulting from the independent technical review shall be documented using the DRChecks system, and shall be resolved prior to forwarding the document for review and approval by higher authority and local interests.

The ITR team leader is responsible for conducting the ITR reviews. ITR team members shall be coordinated with the branch and section chiefs, who will assign individuals familiar with Section 205 feasibility studies.

13. VALUE ENGINEERING: Corps guidelines require that any project over $1 million will undergo a value-engineering study. The purpose of the value engineering study is to ensure that the most economical plan has been identified. The value-engineering study will be

conducted early in the design phase.

14. RESPONSIBILITIES: The following are responsibilities of each study partner, through the planning, design, construction and turnover of the project.

Corps of Engineers: Provide project planning. Perform social, cultural, economic and financial analyses. Prepare environmental documentation (assumed to be Environmental Assessment and Clean Water Act documents). Conduct cultural resource surveys. Coordinate Fish and Wildlife Coordination Act Report by the Fish and Wildlife Service. Prepare feasibility report documents. Coordinate with and resolve Local sponsor issues. Conduct public involvement effort. Prepare cooperation agreements. Conduct hydrologic and hydraulic analyses. Design interior flood control features. Conduct surveys, prepare mapping, perform field investigations, design project features, estimate quantities, prepare cost estimates. Prepare engineering appendices to the feasibility report. Prepare right-of-way drawings for use by real estate. Prepare construction plans and specifications. Conduct HTRW investigation. Update flood insurance study (during construction phase). Constructibility review of report and plans and specifications. Administer construction contract and on-site inspections. Prepare the Preliminary and Final Attorney's Opinion of Compensability and a Project Takings Analysis. Documents to be provided to Real Estate for incorporation into the Real Estate Plan. Prepare a real estate Gross Appraisal of the lands necessary for the Project. Prepare the Real Estate Supplement/Appendix for the feasibility report based on findings in the Attorney's Opinion of Compensability, the Takings Analysis and the Gross Appraisal. Coordinate with the local sponsor and assist in the acquisition of required project real estate and rights-of-entry. Assist the local sponsor with LERRD's crediting during acquisition and/or construction phases. Solicit construction bids and administer other contracted work, including planning, engineering and construction.

Local Sponsor: Review feasibility report and design documents. Participate in meetings. Coordinate with the Corps and the local community. Cost share in the Feasibility Study and Environmental Assessment as defined in the Feasibility Cost Share Agreement. Cost share plans and specifications and construction as defined in the Project Cooperation Agreement. Provide all Lands, Easements, Rights-of-way, Relocations and Disposal (LERRD) sites as required. Operation and maintenance of the completed project.

Executive Committee: The executive committee shall oversee the project. The local sponsor executive committee member is Mayor Jim Ellefson from the City of Ada. The Government executive committee member is Nan Bischoff, Project Manager, Project Management and Development Branch, St. Paul District Corps of Engineers. The MnDNR executive committee member is Pat Lynch.

15. SCOPE OF WORK BY DISCIPLINE:

a. PROJECT MANAGEMENT: Scope of work shall include coordination with Local Sponsor, study team, Minnesota DNR, Mississippi Valley Division, and Headquarters –

U.S. Army Corps of Engineers; developing a project schedule; developing cost share agreements and project study plans; conducting public meetings; preparing news releases; maintaining project accounts; preparation of report documents; coordination of design documents; preparation of draft and final operation and maintenance manuals; any other duties needed to complete the project.

b. ENVIRONMENTAL: Scope of work shall include field trips; input into the plan selection process; preparing an Environmental Assessment, draft FONSI, and Section 404 (b) (1) evaluation; coordinating with the Fish and Wildlife Service to obtain the Fish and Wildlife Coordination Act Report; team meetings; preparing a mitigation plan, if required; coordinating the draft environmental documentation with local, State and Federal agencies; preparing a public notice of the availability of the draft EA and FONSI; monitoring and responding to comments; attending public meetings; and finalizing the EA and FONSI.

c. CULTURAL: Scope of work shall include preparation of scopes of work and contract administration for Phase I and II cultural resources surveys of the levee alignments and borrow areas; coordination with the State Historic Preservation Officer (SHPO); input to the study report; input to the Environmental Assessment; and in-house meetings.

d. ECONOMICS: Scope of work shall include: collection of base data for damage/benefit analysis; set up flood damage analysis (FDA) model; conduct a project affordability analysis based on updated credit-to-levee and discharge-frequency information to ensure that project benefits would support a project of the scope identified in prior studies, perform a benefit analysis; risk analysis, social analysis, and financial analysis; provide input to Environmental Assessment; field trips; report write-up; and in-house meetings.

e. HYDRAULICS: Scope of work shall field trips, input to the survey request, perform a coincidence analysis and design of interior flood control features, hydraulic design, input to risk and uncertainty analysis, HEC-RAS modeling for Judicial Ditch 51 and the old Marsh River, riprap design and in-house meetings.

f. HYDROLOGY: Scope of work shall include discharge-frequency analyses; update the flow-frequency-discharge information, and flow split characteristics needed for the economic analysis, writing a technical appendix; field trips, and in-house meetings.

g. COST ENGINEERING: Scope of work includes team meetings; preparation of cost estimates for alternatives; preparation of cost estimates for NED analysis; preparation of an implementation cost estimate for the feasibility report. Preparation of a construction cost estimate for the design phase.

h. GEOTECHNICAL: Scope of work includes team meetings; contract work to perform supplemental borings and testing; preparation of geotechnical design and drawings, including draft boring logs; input to alternatives analysis; determining soil parameters to be used in design; developing typical levee sections; performing a slope stability analysis, seepage/uplift analysis and a settlement analysis; locating potential borrow sites; input to cost estimates; preparing a geotech and geology appendices to the feasibility report; site visits; and preparing updates and a supplement to the Phase I Hazardous, Toxic and

Radioactive Waste (HTRW) analysis..

i. GENERAL ENGINEERING: Scope of work includes acting as lead engineer for the engineering and construction division; preparation of general drawings; team meetings; acquisition of 1-foot topographic mapping; base drawing layout of all features; site visits; design and calculation of quantities for the alternatives analysis, NED analysis and implementation cost estimates; input to the construction cost estimate; and development of horizontal and vertical control.

j. STRUCTURAL ENGINEERING: Scope of work includes preparation of structural drawings; team meetings; site visits; structural design of the outlets and other interior flood control features; calculating structural quantities to be included in any cost estimates.

k. MECHANICAL/ELECTRICAL ENGINEERING, ARCHITECTURE and LANDSCAPE ARCHITECTURE (MEA): Scope of work includes preparation of mechanical drawings, and electrical drawings, architectural drawings, and landscape drawings; team meetings; mechanical and electrical design of outlets, lift station for sewer line to wastewater treatment plant; and other interior flood control features; providing input to the alternatives analysis and cost estimates.

l. REAL ESTATE: : Scope of work includes coordination; team meetings; preparation of the Real Estate Plan which identifies and describes the lands, easements and rights-of-way required for construction, operation and maintenance of the proposed project, including work to be done by the local sponsor; preparation of the Gross Appraisal, input to the report; assist local sponsor as necessary to obtain rights-of-entry for surveys, borings, cultural resource surveys and any other required entry onto private lands; preparation of all real estate cost estimates for all alternatives; and, in cooperation with the Local Sponsor, conducting one landowner meeting.

m. OFFICE OF COUNSEL: Preparation of the attorney’s opinion of compensability and Project Takings Analysis.

n. INDEPENDENT TECHNICAL REVIEW (ITR): The scope of work includes review of the draft and final feasibility reports, and draft and final plans and specifications to assure that the study team is in compliance with Corps standards; and documentation of the review process.

o. VALUE ENGINEERING TEAM: A team of 5 to 6 independent evaluators will conduct a value engineering study over a 2 to 3 day period, and will present the findings to the study team during the design phase.

p. CONTINGENCIES: Contingencies are included in the project cost estimate to account for any adjustments to the project scope.

q. LOCAL SPONSOR: The City of Ada is the Local Sponsor for the project, and will participate fully in the scoping and decision processes. The City of Ada, in addition to cost sharing 50% of the feasibility study costs, and 35% of the design and implementation costs, shall enter into a project cooperation agreement with the Corps of Engineers and shall assume all responsibilities for operating and maintaining the constructed project in perpetuity.

16. PROJECT COSTS: The anticipated cost of the feasibility, design, construction and project turnover phases is summarized below. Costs for the feasibility study are shared 50% Federal and 50% non-Federal. Costs for design, construction and project turnover are shared 65% Federal and 35% non-Federal.

a.	Prior feasibility study with WRWD as Local Sponsor:	$470,000
b.	Feasibility study with City of Ada as Local Sponsor:	$904,000
c.	Design:	$700,000
d.	Lands and Damages:	$830,000
e.	Construction (including IDC and construction management):	$6,340,000
f.	Project turnover:	$60,000

16. Change Management Plan: There has been an attempt to include enough contingency in the project cost and schedule to avert the need for changes to this Project Study Plan. However, delays in project funding, changes to the scope of work, and scheduling conflicts with other projects cannot all be foreseen. Any intermediate milestone delay of two weeks or more, or individual discipline cost overruns of $2,000 or more, shall warrant review of this Project Study Plan by the Project Manager. Any delay or overrun that results in a four week or more delay of the project completion date, or $10,000 or more increase in overall project costs shall warrant discussion with the project Local Sponsor(s). The Project Manager shall send progress reports via E-mail or other acceptable means, by the 15th of each month, to the City of Ada (Jim Ellefson) and the Minnesota DNR (Pat Lynch).

17. Approval: I hereby approve this project study plan.

Approved by: ______________________________

Nanette M. Bischoff
Project Manager

SECTION 205 FEASIBILITY REPORT

ADA, MINNESOTA

WILD RICE AND MARSH RIVERS, MINNESOTA

APPENDIX L

CORRESPONDENCE

RESOLUTION NO. 2008-01-03

Upon Motion by Roux and second by Ramey, the following Resolution was moved:

WHEREAS, the City of Ada incurred substantial damage during the flood of 1997 after which emergency levees were built; and

WHEREAS, after the 1997 flood the City continues to experience record-breaking flood events including two in June of 2002 in which weaknesses in the existing levees again caused damage within the City; and

WHEREAS, the City has asked the Army Corp of Engineers to conduct an economic analysis for a flood-risk management project in Ada, Minnesota; and

WHEREAS, the Army Corp of Engineers has completed the economic analysis for such a project and has presented the study along with certain recommendations to the City for comments.

BE IT HEREBY RESOLVED that the City supports the Corp recommendation to construct a levee designed to withstand a 200 year flood in conjunction with the rerouting of a portion of Judicial Ditch 51; and

BE IT FURTHER RESOLVED that the city supports construction of levee option areas as described in the Army Corp of Engineers study.

UPON BEING PUT TO A VOTE, the above Resolution was passed by the following vote.

AYES: Darin Ramey, Craig Edwards, Dennis "Woody" Roux, Don Vellenga.

NAYES: None.

ABSENT: Clarence Weippert, Candy Robertson, Jim Austinson.

Dated: January 23, 2008

James Ellefson

James Ellefson, Mayor

ATTEST:

Shelley Kappes

Shelley Kappes, City Clerk

NON-FEDERAL SPONSOR'S
SELF-CERTIFICATION OF FINANCIAL CAPABILITY
FOR DECISION DOCUMENTS

I, Shelley Kappes, do hereby certify that I am the Chief Financial Officer of the City of Ada, Minnesota

(the "Non-Federal Sponsor"); that I am aware of the financial obligations of the Non-Federal Sponsor for the Ada Section 205 project, and that the Non-Federal Sponsor will have the financial capability to satisfy the Non-Federal Sponsor's obligations for that project. I understand that the Government's acceptance of this self-certification shall not be construed as obligating either the Government or the Non-Federal Sponsor to implement a project.

IN WITNESS WHEREOF, I have made and executed this certification this 31st day of March, 2008.

BY: Shelley Kappes

TITLE: City Clerk-Treasurer
City of Ada

DATE: 3-31-08

ENCLOSURE 3